NEDL TRANSFER
HN 6N1X H

KG 428

SHELF..... ACCESSIONS 37,875

THE BOSTON-LIBRARY SOCIETY.
ORGANIZED 1792. INCORPORATED 1794.
18, BOYLSTON PLACE.

Added Apr. 26, 1899.

To be returned in five weeks. A fine of one cent will be incurred for each day this volume is detained beyond that time.

CHANDLER'S

ENCYCLOPEDIA

AN EPITOME

OF

UNIVERSAL KNOWLEDGE

IN THREE VOLUMES

EDITED BY

WILLIAM HENRY CHANDLER, PH.D., F.C.S.

OF THE LEHIGH UNIVERSITY

WITH CONTRIBUTIONS FROM A LARGE NUMBER OF EMINENT SCIENTISTS

ILLUSTRATED BY COLORED MAPS AND ENGRAVINGS

VOLUME THREE

NEW YORK

PETER FENELON COLLIER

MDCCCXCVIII

KG 428

HARVARD
UNIVERSITY
LIBRARY
MAR 5 1941

COPYRIGHT, 1898
BY
WILLIAM HENRY CHANDLER

THE
BOSTON LIBRARY
SOCIETY

begin 870 m. from the sea. The delta extends 175 m. along the coast, and is crossed by above 50 channels. The tide is felt for 270 m.

The Orinoco at Caicara.

Orioles. True orioles are tropical Old World birds, in general appearance resembling the American orioles, which belong to a distinct family (*Icteridæ*). The Golden Oriole visits England. American orioles build pendent nests. The Mexican Troupial is celebrated for its melodious, clear notes. Most of the species are S. American. See BALTIMORE ORIOLE.

Orion. In Mythology, hunter, blinded or slain, and finally placed among the stars.

Oriskany. Village of Oneida co., N.Y.; scene of a battle between 800 Americans under Gen. Herkimer and a force of Tories and Indians, Aug. 6, 1777.

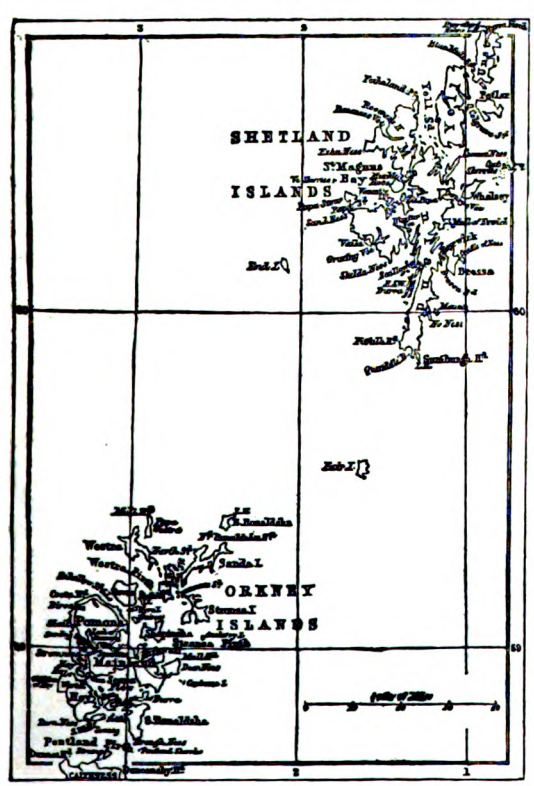
Oriskany Sandstone. Bed at the base of the Devonian, chiefly in N. Y. and Pa. It is thin but widespread, and contains a somewhat peculiar fauna. See DEVONIAN.

Orissa. Former state of e. India, now part of Bengal. Pop., 1891, 3,865,020.

Orizaba. Volcanic peak in Mexico, between the capital and Vera Cruz. Ht. 18,314 ft.

Orkian, 1290–1360. Son and successor of Othman, founder of the Turkish empire; Sultan from 1326. He took sundry Greek towns in Asia and Europe, and organized the Janissaries.

Orkney Islands. Numerous group n.e. of Scotland, 29 being inhabited; called Arcades by classical writers; conquered



Orkney Islands.

by Norwegians 876; annexed to Norway 1098, to Denmark 1397, and to Scotland 1468. Area 375 sq. m.; pop., 1891, 30,453.

Orlando. See ROLAND.

Orleans. City of France, on the Loire, 75 m. s.s.w. of Paris; besieged by Attila 451; twice plundered by Northmen; besieged by the English 1428–29, but relieved by Joan of Arc; prominent in the Huguenot wars and in that of 1870. It had a university 1312–1789, and has a large trade. Pop., 1891, 63,705.

Orleans, BASTARD OF. See DUNOIS.

Orleans, DUKES OF. CHARLES, 1391–1465; French commander at Agincourt 1415; prisoner in England till 1440; lyric poet; father of Louis XII.—JEAN BAPTISTE GASTON, 1608–1660; third son of Henry IV.; Duke 1626; busy in intrigues against

Captivity of the Duke of Orleans in the Tower.
(From an Illumination in the Royal MS.)

Richelieu and Mazarin.—PHILIPPE, 1674–1723; grandson of Louis XIII.; able general and notorious debauchee; Regent from 1715.—LOUIS PHILIPPE JOSEPH (ÉGALITÉ), 1747–1793; revolutionist, deserting his order and voting for the king's execution; guillotined; father of King Louis Philippe.

Orleans, MAID OF. See JOAN OF ARC.

Orleans, TERRITORY OF. Louisiana; so termed 1804–12.

Orley, BERNAERT VAN, 1490–1560. Flemish painter, historically important as one of the first transmitters of Italian influence.

Orloff. Russian family: Gregory, 1734–1783, planned the murder of Peter III., which was executed 1762 by his brother Alexis. Their nephew, Alexis, 1787–1861, was a noted diplomatist.

Orloff. See HORSE.

Orlop. Deck of a ship on which the cables are stowed.

Ormerod, ELEANOR, b. ab. 1835. English entomologist. *Insect Life*, 1884.

Ormolu. See COPPER, METALLURGY OF.

Ormonde, JAMES BUTLER, FIRST DUKE OF, 1610–1688. Earl 1632; Commander in Ireland 1640–43; Lord-lieut. 1644; active royalist; made Duke 1660; Viceroy of Ireland 1662–69 and 1676–85.—His grandson and namesake, 1665–1746, 2d duke 1688, Lord-lieut. of Ireland 1703, held command against France and Spain 1711, and was impeached and attainted 1715.

Ormulum. Series of homilies on the Gospel history, in Semi-Saxon verse, by Orm, ab. 1220: in the Bodleian library at Oxford; discovered 1659, pub. 1852.

Ormuz, STRAIT OF. Passage connecting Persian Gulf with Sea of O., which is an arm of the Arabian Sea or Indian Ocean.

Ormuzd, ORMAZD, or AHURA-MAZDA. Chief deity of Zoroastrianism, source and representative of good, opposed to the evil Ahriman.

Ornithadelphia. See PROTOTHERIA.

Ornithichnites. Footprints of birds, found chiefly on slabs of the Trias.

Ornithology. Natural history of birds. The extant portions of Aristotle's works treat of 170 species of birds. No further contributions of importance were made until the time of Turner, 1544, Gesner, and Belon; but the foundations of the science were not laid until 1676, by Willughby and Ray. The binomial classification of Linnæus was introduced 1735 and improved by Brisson 1760. Buffon introduced 1783 the conception of variation of species. In 1812 Merrem started the modern system of classification. In 1831 Swainson developed the conception of Evolution, and Nitsch sought a natural classification. In 1835 Sundevall began to recognize the importance of internal structure as furnishing classificatory characters. This conception was supported by the paleontological discoveries of connecting links between Birds and Reptiles, begun 1861, worked out by Owen 1863, Huxley 1867, Milne-Edwards 1871, Marsh 1872, and fully developed in the latter's *Odontornithes*, 1880. These data have stimulated Sclater to present a revised system of the Birds. Besides the authors above mentioned, the following, with main date of publication, are the most important. Catesby, 1731; Brünnich, 1764; Forster, 1771; Fabricius, 1780; D'Aubenton, 1780; Pennant, 1785; White, 1789 (Nat. Hist. of Selborne); Bartram, 1791; Barton, 1799; Le Vaillant, 1801; Bewick, 1804; Tiedemann, 1810; Illiger, 1811; Naumann, 1817; De Blainville, 1820; Audubon, 1827; Wilson, 1828; Bonaparte, 1831; Keyserling and Blasius, 1839; Gervais, 1856; Parker, 1860; Coues, 1884; Ridgway, 1887.

Ornithophilous. Flowers which are cross-fertilized by birds, which carry the pollen of one to the pistils of another. The Humming Birds are especially active in this process.

Ornithorhynchus. Duck-billed water-mole of Australia, also called Platypus; brown aquatic mammal, 18 in. long, with webbed feet. It burrows into muddy banks and feeds on shellfish, etc. Its jaws are ensheathed by a duck-like bill: four horny molar teeth are present. The tail is short and flat. The

Duck-billed Water-mole (*O. anatinus*).

males have movable spurs on the hind legs, perforated and connecting with poison glands. These creatures resemble birds still more in their internal anatomy. A well-developed coracoid bone is present; there is a cloaca, and the young are born from eggs. Epipubic bones are present, but no marsupial pouch.

Ornithosauria. Flying Reptiles, now extinct, but abounding in the Jurassic period. The limbs were specialized to hold a web, as in bats, except that the little finger was greatly prolonged, to support the anterior edge of this patagium, the other fingers being free, and the thumb rudimentary. The head was like that of modern birds; even the jaws were incased in a horny beak, which usually bore teeth. The shoulder girdle was avian; the pelvis was saurian. The bones were provided with air-sacs; the blood was warm, but no feathers were present. In size the *Pterodactyls* ranged from that of a sparrow to that of a condor. One from the Kansas chalk deposits had a spread of wing of 25 ft. They inhabited both continents. It is probable that none of their descendants now remain. The Birds are descended from the *Dinosaurs*, which belong to the order *Ornithoscelida*. See PTEROSAURIA.

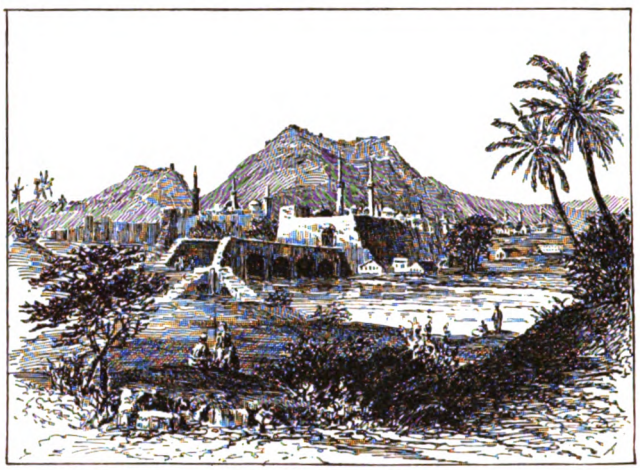
Ornithoscelida. Order of extinct Reptiles whose hind limbs, etc., show bird-like characters. Here are included the *Dinosauria* and *Compsognathus*. In the latter the head is bird-like, the neck vertebræ are long, the anterior ribs short, the posterior long, and the astragalus is fused with the long tibia. The pubis and ischium are elongated downward, and the ilium extends forward.

Orobanchaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 12 genera and ab. 150 species, scattered through the temperate and warm regions of Europe, Asia, Africa, and America; called the Broom-rape family.

Orography. Department of Geology which considers the structure, geological history, age, and mode of formation of mountains of every kind and size, including all elevations above the general level of a country. See MOUNTAIN and MOUNTAIN STRUCTURE.

Orohippus. See EQUIDÆ.

Orontes. River of Syria, flowing n. to Antioch and thence w. to the Mediterranean; now Nahr-el-Asi. It was originally



Valley of the Orontes.

called Typhon, from a mythical dragon who is said to have traced its course with his tail, but later after Orontes, who built a bridge across it. Length ab. 240 m.

Orosius, PAULUS. Spanish presbyter of 5th century, whose 7 books of *History against the Pagans*, extending to 417, were much valued in the Middle Ages, and tr. into Anglo-Saxon by Alfred.

Orozco y Berra, MANUEL, 1816–1881. Mexican historian.

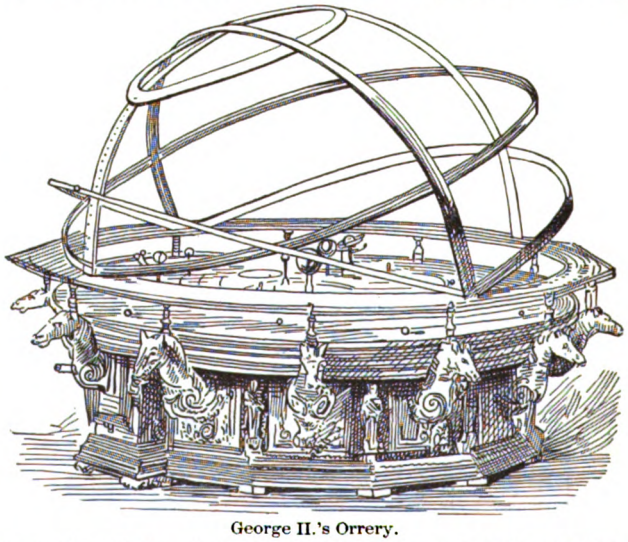
Orpheus. In Greek Mythology, Thracian musician of extraordinary gifts. Apollo gave him the lyre, and the Muses taught him its use; by its strains he tamed wild beasts, made trees follow him, and won back his wife Eurydice from Hades, but lost her again because he could not refrain from looking back at her before reaching the upper world. Many hymns and poems are credited to an Orphic fraternity, which existed till ab. 300.

Orpiment. As_2S_3. Natural ARSENIOUS SULPHIDE (q.v.), of yellow color, occurring in small quantity and usually as a product of alteration of ores containing arsenic.

Orpine. See LIVE-FOREVER.

Orr, JAMES LAWRENCE, 1822–1873. M.C. 1849–59; Senator C.S.A. 1862–65; Gov. of S. C. 1865–68; Circuit Judge for S. C. 1870; U. S. Minister to Russia 1872.

Orrery. Machine constructed for the purpose of showing



George II.'s Orrery.

the motion of the planets round the sun, and of the satellites round their primaries. Made by Rowley for the Earl of Orrery

in 1715. Though not accurate it gives a general notion of the way in which the planetary motions are performed.

Orris-Root. Rootstocks of certain species of *Iris*, natives of s. Europe, smelling strongly like violets and used in perfumery.

Orsay, ALFRED GUILLAUME GABRIEL, COUNT D', 1801–1852. French "glass of fashion and mold of form," long prominent in London.

Orsini. Princely family, long prominent in Rome; Guelphs and enemies of the Colonnas. Two of them became popes, 1277 and 1724.

Orsini, FELICE, 1819–1858. Italian fanatic, bred to conspiracies; sentenced to the galleys 1844, pardoned 1846; deputy 1849; imprisoned 1855; executed in Paris for killing and wounding many persons in an attempt on the life of Napoleon III. Jan. 14.

Ortega, CASIMIRO GOMEZ, 1740–1819. Director of the Botanical Gardens in Madrid. *Tabulæ botanicæ*, 1773.

Ortel, ABRAHAM, 1527–1598. Flemish geographer. *Theatrum Orbis Terrarum*, 1570; *Thesaurus Geog.*, 1578–96.

Orth, GODLOVE STONER, 1817–1882. M.C. from Ind. 1863–71, 1873–75, and from 1879; U. S. Minister to Austria 1875–77.

Orth, JOHANNES, b. 1847. Prof. Göttingen 1878; writer on pathology.

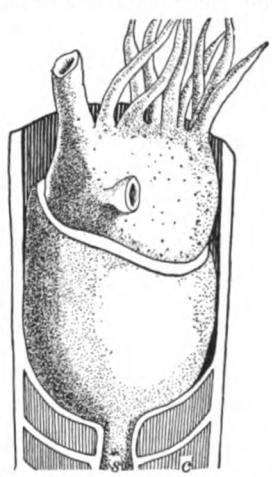
Orthez. Town of s. France, near which Wellington defeated a French army under Soult Feb. 27, 1814. Pop. ab. 4,800.

Orthis. Palæozoic Brachiopod genus, containing numerous species; originally distinguished by the straight hinge line.

Ortho Acids. Usually the ordinary form, derived from normal acids by the abstraction of one or more molecules of water; *e.g.*, normal phosphoric acid, $P(OH)_5$, by loss of one molecule of water becomes orthophosphoric acid, H_3PO_4.

Orthoceras. Straight chambered Palæozoic shell, allied

Fragment of *Orthoceras crebriseptum* — Cincinnati Group, North America, of the natural size. The lower figure is a section showing the air-chambers, and the form and position of the siphuncle.



Restoration of *Orthoceras*, the shell being supposed to be divided vertically, and only its upper part being shown. *a*, Arms; *f*, Muscular tube ("funnel") by which water is expelled from the mantle-chamber; *c*, Air-chambers; *s*, Siphuncle.

to the nautilus; sometimes in the Cambrian and Silurian attaining a length of 15 ft. There are many species, from the Silurian to the Liassic. See TETRABRANCHIATA.

Orthoclase. $KAlSi_3O_8$. Common FELDSPAR (q.v.); distinguished from quartz by its pearly cleavage, and from mica by its greater hardness.

Ortho Compounds. Wherever this prefix is used, see the main word; *e.g.*, for ortho-toluidine see toluidine. See META and BENZENE HYPOTHESIS.

Orthodox School of Political Economy. Group of economists who have followed with comparative closeness the teachings of Adam Smith, Malthus, Ricardo, and the other early English economists.

Orthodoxy. Correct religious opinions, as opposed to heterodoxy or heresy; variously defined according to the point of view.

Orthoepy. Branch of grammar dealing with pronunciation.

Orthognathi. Division of mankind having slightly projecting jaws and teeth, as in the European races. They have a high facial angle. See MAN and CRANIOMETRY.

Orthogonal. Right angled: operations such as transformation, projection, etc., and their results, in which the movement is at right angles to a fixed base.

Orthogonal Transformation. From one set of rectangular axes in space to another having the same origin. Point distances from origin are unchanged, and the transformation is automorphic.

Orthographic (ORTHOGONAL) **Projection.** That in which points or lines are projected by lines or planes perpendicular to the base of projection.

Orthography. Correct spelling; of increasing importance as the number of words increases and the standard of education rises; formerly optional in England, especially with proper names.

Orthoneura. See TÆNIOGLOSSA.

Orthopedic Surgery. Branch of surgery dealing with operations and mechanical appliances used to correct deformities; *e.g.*, club-foot, curved backs from spinal disease, primarily in children.

Orthoptera. *Insecta* with incomplete metamorphosis, with two pairs of wings, which in the *Pseudoneuroptera* are membranous and alike (with close nervures), and cannot be folded; but, in the *Orthoptera genuina*, the anterior pair are small and hard, the hinder ones are broad and membranous and can be folded together longitudinally beneath the anterior pair. The jaws are fitted for biting. The genuine *Orthoptera* comprise the tribes *Cursoria*, *Gressoria*, and *Saltatoria*. The *Pseudoneuroptera* comprise the tribes *Physopoda*, *Corrodentia*, and *Amphibiotica*. Grasshoppers and Dragon-flies are illustrations of the two main groups respectively.

Orthostichous. Straight row of leaves or other organs.

Orthostyle. Straight row of columns detached and not forming a portico.

Orthotropous. Straight ovule, *i.e.*, one not bent nor curved; also called Atropous.

Orton, ARTHUR (alias THOMAS CASTRO), b. 1834. Claimant in the TICHBORNE CASE (q.v.), 1871–72; tried for perjury 1873–74, and sentenced to 14 years with hard labor. In 1895 he confessed the imposture.

Orton, EDWARD, LL.D., b. 1829. Prof. Antioch Coll. 1865–73; Pres. Ohio State Univ. 1873–81; state geologist of Ohio, assistant and chief, from 1869; author of reports and numerous papers on the Geology of Ohio. His principal work has been upon the Coal and Gas fields of Ohio.

Orton, JAMES, 1830–1877. Prof. Vassar Coll. from 1869; explorer in S. America 1867–68, 1873, and 1877. *Andes and Amazon*, 1870–76; *Comparative Zoölogy*, 1875.

Ortygia. 1. Island in Bay of Syracuse, Sicily, occupied by part of the city. 2. Delos.

Orvieto. Ancient town of central Italy, noted for its cathedral, built 1290–1580; resort of many popes in distress. Pop. 7,900.

Oryx. Several species of African Antelopes, characterized

Oryx (*Oryx beisa*).

by very long, nearly straight, upward growing horns, with rings near the base. The hair is yellowish, variegated with

black marks on the head, flanks, etc. The forequarters are strongly developed as compared with the hindquarters.

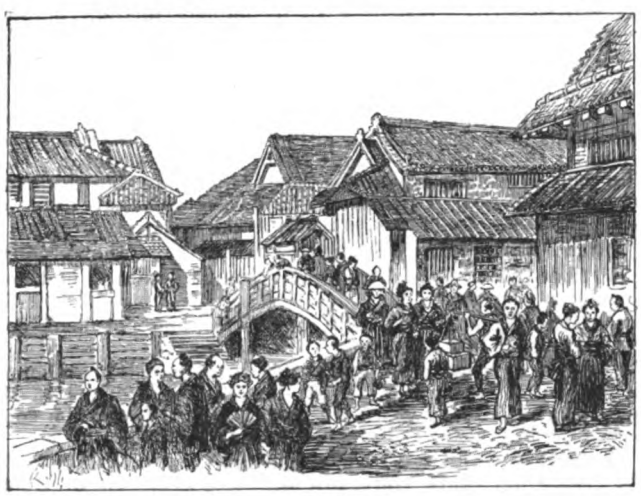
Orzeszkowa, ELIZA, b. 1842, m. 1858. Polish novelist and essayist.

Osage Indians. Southern Sioux of Kansas; originally ab. 5,000. They sided with the Confederacy 1861, and are now ab. 1,000, on a reservation in n.e. Indian Territory.

Osage Orange. *Toxylon pomiferum.* Thorny tree of the Mulberry family, native of the s. central U. S., bearing a large, yellow fruit, the color and size of a very large orange; also called Bow-wood, and entensively planted for hedges.

Osage River, or MARAIS DES CYGNES. Right hand branch of the Missouri, rising in Kansas, and flowing e. through Mo.; navigable for 50 m. Drainage area 15,262 sq. m.

Osaka, or OZAKA. Seaport of Japan, on s.e. coast of Niphon at the mouth of Kamagawa River, which intersects it with streams and canals; important for its commerce; once



Osaka.

capital of the empire; site of the mint since 1871. Its castle, built ab. 1583 by Hideyoshi, is notable, and contained a fine palace, burned 1868. Pop., 1893, 483,600.

Osborn, LAUGHTON, 1809–1878. American poet.

Osborn, SELLECK, 1783–1826. American poet and journalist.

Osborn, SHERARD, R. N., 1822–1875. Arctic explorer, in search of Franklin 1849 and 1852; prominent in the Crimean and Chinese wars; Admiral 1873. *Arctic Journal*, 1852; *Sir John Franklin*, 1860.

Osborne House. Marine residence of Queen Victoria, built 1845 by Cubitt, on the Isle of Wight, near Cowes.

Osbourne, LLOYD, b. ab. 1865. Stepson of R. L. Stevenson, and his collaborator in *The Wrong Box*, 1889, *The Wreckers*, 1893, and *The Ebb Tide*, 1894.

Oscan. Italic dialect, spoken by Samnite and other tribes, and still important in the time of Ennius; represented only by inscriptions, which go back to 4th century B.C.

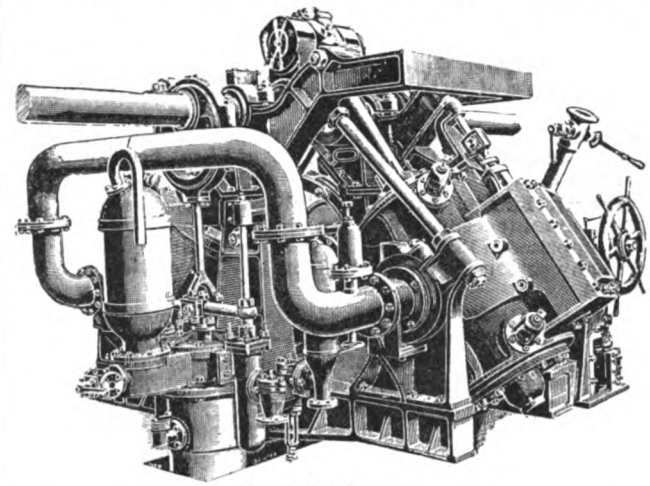
Oscanyan, HATCHIK, b. 1818. Armenian novelist, resident in America from 1855. *The Sultan and his People*, 1857.

Oscar I., 1799–1859. Son of Bernadotte: King of Sweden and Norway 1844; publicist and musician.—His son, OSCAR II., b. 1829, king 1872, is noted as a poet and orator. *Works*, 5 vols., 1875–94.

Osceola, 1804–1838. Chief of the Seminole tribe of Indians, who, in retaliation for the enslavement of his wife, began war in Fla. 1835; captured by treachery 1837.

Oscillariaceæ. Order of *Cyanophyceæ*, minute blue-green *Algæ* comprising forms with motile filaments, divided by septæ into numerous tabular pseudocysts.

Oscillating Engine. Steam engine in which the end of the piston-rod fits upon the crank-pin, and the excursion of the crank-pin on both sides of a given diameter of its circle is admitted by causing the cylinder to swing upon trunnions. There being no connecting-rod, the engine is much more compact. The live steam and exhaust pass in and out through the trunnions, and the valve is either moved by being linked to the fixed frame, or else the rocking of the trunnion surface causes ports to be properly opened and closed. Leakage at the stuffing box and trunnions is a great source of annoyance. These engines have been used for marine practice, especially



Oscillating Engine.

in side-wheel vessels, where the cylinder can be under the shaft. See MARINE ENGINES.

Oscines. Singing birds; divided into *Spizognathæ*, with conirostral beak, as the Weaver, Finch, Crossbill, and Sparrow, and the *Coracognathæ*, of which the Wagtail, Thrush, and Crow are dentirostral, the Lark and others conirostral, the Honey-eaters (*Meliphagidæ*) tenuirostral, and the Swallow fissirostral. See PASSERES.

Oscott. R. C. college near Birmingham, Eng., founded 1752, enlarged 1835; for education of priests only since 1889.

Osculating Circle. One having the highest order of contact with a curve at a given point. Its radius is called the radius of curvature.

Osculating Circle in Space. One which passes through three consecutive points of a curve in space. Its center is the point where the line of section of two consecutive normal planes cuts the osculating plane.

Osculating Conic. In coördinate geometry, the conditions under which the general conic osculates with a curve of given order can be established, and the specific character of the conic determined, by examining the (invariant) criterion of the general conic in connection with the coördinates of the point of osculation.

Osculating Plane. One coincident with three consecutive points of a curve.

Osculation. Highest order of curve contact.

Osculatrix. Curve having a higher order of contact with a given curve than any other of its kind.

Osculum. Exhalent opening of the sponge. Many of these are not the same as the oscule of the simpler sponges, which represents the exhalent opening of the embryo sponge. Sometimes this opening, simple or branched, becomes reduced to irregular canals that lead to a special set of small pores, secondarily developed in the cortex of the sponge. Such openings are pseudoscula or pseudoprocts.

Osgood, EMMA ALINE, b. ab. 1852. American singer, known chiefly in England since 1876.

Osgood, FRANCES SARGENT (LOCKE), 1811–1850. American poet.

Osgood, SAMUEL, 1748–1813. Delegate to Congress 1780–84; Commissioner of Treasury 1785–89; U. S. Postmaster-gen. 1789–91.

Osgood, SAMUEL, D.D., LL.D., 1812–1880. Pastor in New York 1849–70. *Milestones*, 1855.

Osgoodites. Millenarian sect in N. H., now extinct.

O'Shaughnessy, ARTHUR WILLIAM EDGAR, 1846–1881. English poet.

Oshkosh. Capital of Winnebago co., Wis.; on Fox River, at its mouth in Lake Winnebago. It has large manufactures, especially of lumber. Pop., 1890, 22,836.

Osiander, ANDREAS, 1498–1552. German reformer and theologian, prof. Königsberg 1549. He modified the doctrine of justification by faith in a mystical direction, which was supposed to bring it nearer to the R. C. view. His followers were

driven from Prussia 1567; their leader, his son-in-law, FUNCK, was beheaded for alleged treason 1556.

Osier. See WILLOW.

Osiris. Chief deity of ancient Egypt; brother and husband of Isis; slain by Set, and avenged by his son Horus; judge of the dead.

Osiris.

Osler, EDWARD. 1798–1863. English hymnist; ed. *Church and King*, 1836–37.

Osler, WILLIAM, M.D., b. 1849. Prof. McGill Univ. 1874, Univ. Pa. 1884, and Johns Hopkins Univ. 1889; medical writer.

Osler's Anemometer. Square plate of metal exposed perpendicular to the wind, whose pressure upon it is resisted by springs.

Osman. See OTHMAN.

Osmanli. See TURKS.

Osman Pasha, b. 1832. Turkish general, distinguished at Plevna, where he blocked the Russian advance Aug.–Dec. 1877.

Osmic Acid. See OSMIUM OXIDES.

Osmiridium. Alloy of osmium and iridium, found in nature and made artificially for tipping gold pens. See OSMIUM.

Osmium. Os. At.wt. 190.8, sp. gr. 22.477, sp. ht. .031, valence II., IV., VI., VIII. Infusible; discovered by Tennant 1803; heaviest of all metals; rare. It occurs in platinum ores as an alloy of iridium. When heated, or treated with nitric acid, it is converted into the peroxide, OsO_4, the vapors of which are poisonous. It is not used in the arts, but an alloy of osmiridium, which is not attacked by acids, is employed for tipping gold pens, and, since it is not oxidizable and non-magnetic, is sometimes used for the bearings of the mariner's compass.

Osmium Chlorides. $OsCl_2$. Dichloride. Brownish-black powder, soluble in water, with a dark-violet color; made by heating powdered osmium in a current of dry, air-freed chlorine.—$OsCl_4$. Tetrachloride. Red substance, soluble in water; made by heating the dichloride in a stream of chlorine.

Osmium Oxides. OsO. Osmium monoxide. Grayish-black, insoluble powder.—Os_2O_3. Osmium sesquioxide. Black powder, insoluble in acids.—OsO_2. Osmium dioxide. Masses, of a coppery luster.—OsO_4. Osmium tetroxide. Usually called osmic acid; formed by heating finely-divided osmium. It sublimes in transparent needles, which are readily soluble in water, yielding a colorless liquid, which does not affect litmus and possesses a burning and caustic taste. It has a powerful, penetrating odor suggestive of chlorine, is very poisonous, and acts violently and seriously upon the eyes.

Osmium Sulphides. OsS_2. Disulphide. Yellowish brown precipitate, obtained on passing hydrogen sulphide into a soluble osmium salt.—OsS_4. Tetrasulphide. Precipitated by hydrogen sulphide from a hydrochloric acid solution of the tetroxide.

Osmosis, or OSMOSE. Diffusion of a liquid through a membrane. See ENDOSMOSIS and EXOSMOSIS.

Osmundaceæ. Order of Ferns, of a small number of species, growing mainly in bogs; including the common Royal fern or Flowering fern and the Cinnamon fern.

Osnabrück. Town of Hanover, on the Hase, 75 m. s.s.w. of Bremen; founded 772; seat of a bishop from ab. 810. Here the peace of Westphalia was signed 1648: George I. of England died on the way to it 1727. It has some manufactures. Pop., 1890, 39,929.

Osorio, MANOEL LUIZ, MARQUIS OF HERVAL, 1808–1879. Brazilian general, distinguished in wars with Uruguay and Paraguay; Senator 1877, Minister of War 1878.

Osphradium. Olfactory organ of Mollusks; patch of sensory cells near each gill.

Ospina, MANUEL, 1803–1885. Pres. of Colombia 1856–61; then in exile till 1872.

Osprey (PANDION HALIAETUS). Falconoid bird, widely distributed, abundant along U. S. Atlantic coast, where it nests in old trees. The rarer European Osprey prefers cliffs near inland waters. Length 2 ft., color dark brown, the head and under parts white. Bill sharply hooked; tarsus long, feet large, with outer toe reversible, and with strong equal claws, adapted

Osprey.

for holding fish; a strong flyer. Eggs 2–4, closely blotched with brown.

Ossa AND **Pelion.** Mountains in Thessaly; the giants in their war with the gods attempted to scale heaven by piling them on Olympus.

Ossein. Organic material composing one-third of the substance of bone, identical with collagen. Collagen is the substance of which the white fibers of connective tissue are composed.

Ossetish. Iranic language spoken by the Ossetians of the Caucasus. The sound of *h*, common in Iranian, is absent.

Ossian. Gaelic bard of 3d or 4th century, to whom were ascribed many legends of much later date, probably 1100–1500. These were collected and expanded by JAMES MACPHERSON (q.v.), 1760. Their origin was the subject of much discussion.

Ossification. Process by which bone-tissue is produced. A formation of cartilaginous substance precedes that of the bone, and in this the deposit of the lime-salts takes place making the bone. It is deposited from centers extending by additions in the various directions needed for the shape of the bone. Where there are cavities in the bones, these are formed by the absorption of bone-tissue, the process of ossification being continuous, and, when the individual has attained maturity and there is no further absorption, the proportion of bony material increases, rendering the bones brittle in age. Ossification is also applied to the deposit of calcareous matter in other tissues, as ossification of the arteries or of the heart.

Ossoli, SARAH MARGARET (FULLER), MARCHIONESS, 1810–1850, m. 1847. American author, of much influence with the Boston transcendentalists.

Ostade, ADRIAN VAN, 1610–1685. Dutch genre painter, who affected low life-subjects with great success.—His brother, IZAAK, 1621–1649, was of less note.

Ostend. Seaport of Belgium, 14 m. w. of Bruges; well-known watering-place. Pop., 1886, 22,602.

Ostend Manifesto. Drawn up Oct. 1854 by U. S. ministers to Britain, France, and Spain, J. Buchanan, J. Y. Mason,

and P. Soulé, favoring the purchase or seizure of Cuba. It was ineffective.

Ostensory. See MONSTRANCE.

Osteolepis. Crossopterygian lepidoganoid, with smooth, rhomboidal scales; one of the first discovered armor-clad fish of the Old Red Sandstone (Devonian).

Osteolite. $Ca_3P_2O_8$. Bone-phosphate; earthy variety of calcium phosphate, allied mineralogically to apatite, but constant and definite in chemical composition.

Osteology. Branch of Anatomy which treats of the bones and skeleton. When the homologous bones of different animals are compared in a systematic manner, it is Comparative Osteology.

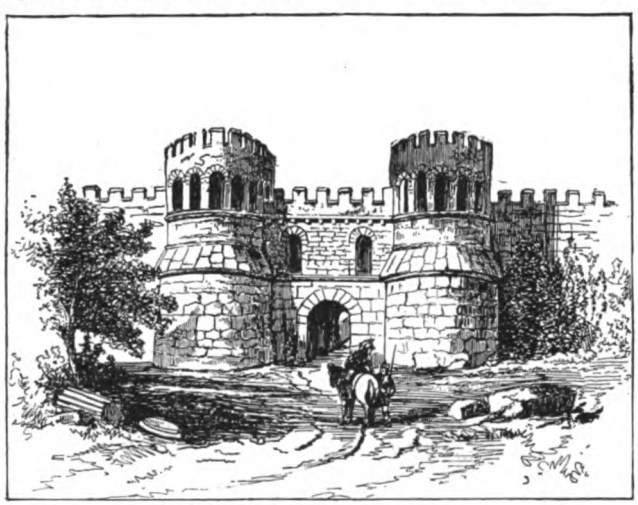
Osteostraci. Group of Cephalaspidian fishes (?) whose shields show true bony structure.

Osterwald, JEAN FRÉDÉRIC, 1663–1747. Swiss theologian, pastor at Neûchatel.

Osthoff, HERMANN, b. 1847. Prof. Comparative Philology at Heidelberg 1877.

Ostia. Openings in the walls of sponges, etc. Exhalent ostia pass water out of the system; inhalent ostia draw it in.

Ostia. Port of ancient Rome, at mouth of Tiber; once populous and important; supplied with a new harbor ab. 50; in



The Walls of Rome. The Ostian Gate.

ruins by 830; excavated partially 1783, and more fully since 1855.

Ostiaks. Finnish and Mongolian tribes of n. Siberia, on the Obi and Yenesei Rivers, numbering ab. 27,000; some are mixed with the Samoyedes. They are of medium stature, dark skinned and brachycephalic. They are gentle, honest, and skillful. A few are Christian, but Shamanism is prevalent.

Ostiole. Orifice of the sexual conceptacles in certain *Algæ* and *Fungi*.

Ostrach AND **Stockach.** Villages in Swabia, scenes of victories March 25, 1799, of Archduke Charles over the French under Jourdan.

Ostracion. See PLECTOGNATHI.

Ostracism. Provision in the Athenian constitution, devised ab. 509 B.C. by Cleisthenes, to prevent any citizen from becoming too powerful. The citizens first carried a popular decree directing its use; then, on an appointed day, cast their votes by tribes, each writing upon an oyster-shell the name of the person whom he considered most dangerous to the state. The man having the highest number of votes, if at least 6,000, was banished for ten years, or, later, for five. Confiscation was not involved.

Ostracoda (WATER-FLEAS). *Entomostraca*, completely inclosed in a bivalved shell, resembling the mussel. There are seven pairs of appendages, which function respectively as antennæ, jaws, creeping and swimming legs. The body is short and unsegmented. A paired, median eye is present, and sometimes a heart also; this is wanting in *Cypris*.

Ostracostei. See PLACODERMI.

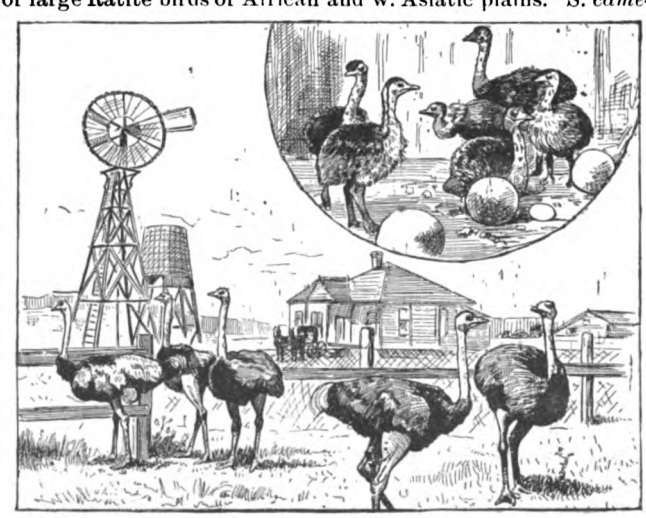
Ostreidæ (OYSTERS). Family of Lamellibranchs, belonging to the section *Monomyaria*. The right valve of the shell is smaller and flatter than the left, on which the animal rests. The adductor muscle is nearly central, and is called the heart or eye by oystermen; the heart lies just in front of this. Organs of vision are supposed to be rudimentary if present at all; certain pigment spots at the edge of the mantle may be taken as such. The posterior end of the shell is the nib furthest from the hinge, which here is anterior, and not dorsal as in other groups. The French Oyster (*Ostrea edulis*) is hermaphrodite and viviparous, and produces as many as 2,000,000 young. The American Oyster (*O. virginiana*) is bisexual, the eggs being fertilized and undergoing development after being spawned. As many as 60,000,000 eggs may be produced from one female, only one or two of which ever reach the market as mature oysters. The mortality is great, especially in the early stages, when the young is but the one-five-hundredth of an

French Oyster.

Oyster, lying in left valve: *a*, hinge; *b*, lips, surrounding the mouth; *c*, points just below the region of heart; *d*, gills; *e*, dorsal edge of mantle; *f*, muscle; *g*, posterior end of shell.

inch in diameter. The oyster spawns from May to August in waters n. of the Chesapeake; the spawning season is more prolonged in southern waters. Both sexes spawn together, so that the water becomes milky with suspended eggs and milt. The eggs sink at the rate of a foot per hour. The majority have settled into the mud by the time segmentation has begun, unless the flowing tides produce whirling currents. The best temperature for development is between 80° and 90° F. In ab. 12 hours the young embryo has advanced as far as the gastrula stage, swimming by means of cilia. This locomotor stage lasts for several days, and finally a shell of two equal valves is formed, and two muscles, anterior and posterior, are developed. The anterior adductor never comes to a further development. Then the young oyster, now resembling a clam, settles on a clean object and cements itself by its left side. In further development the body rotates so as to bring the front end under the back (hinge) area, and the two shell valves grow differently. See OYSTER CULTURE.

Ostrich (STRUTHIO). Three or four closely related species of large Ratite birds of African and w. Asiatic plains. *S. camelus* is the common ostrich. It has powerful legs, with only 2 toes (3d and 4th), of which the outer is relatively little devel-



Ostrich Farm in California.

oped. It can outrun and exhaust a horse. The feathers are plumes, forming no true web. The wings are small, and cannot be used in flight. The syrinx is imperfectly developed, but the voice (seldom used) is a lion-like roar. The female and young are brownish-gray, the male black, with white wing and tail plumes. A ht. of 7 ft. and wt. of 300 lbs. are attained. They defend themselves by kicking. They are naturally monogamous. The eggs, 6 in. long and equal to 24 hen's eggs in capacity, are laid every other day. When ab. ten are laid, the sexes take turns at the incubation. Ostriches have been domesticated by African tribes from remote periods. The English began ostrich-farming in s. Africa 1865. This profitable branch of agriculture has been introduced into both Americas. See RHEA.

Ostrogoths. See GOTHS.

Ostrovski, ALEXANDER, 1824–1886. Russian dramatist.

Ostrowski, TOMAS ADAM RAWICZ, COUNT, 1739–1817. Polish statesman.—His son, ANTONI JOANNES, 1782–1847, served under Napoleon, and bore part in the rising of 1830–31.

Osuna, PEDRO TELLEZ GIRON, DUKE OF, 1579–1624. Spanish general, Viceroy of Sicily 1611 and Naples 1616; imprisoned from 1620.

Oswald, ST., ab. 605–642. King of Northumbria 632, which he Christianized; killed in battle with pagans.

Oswald, HEINRICH SIEGMUND, 1751–1834. German hymnist.

Oswego. Capital of O. co., N. Y., on Lake Ontario, at mouth of O. River; taken July 14, 1756, by Montcalm, and by the British May 6, 1814; chartered 1848; site of a State Normal School. It has numerous flour mills, iron works and grain elevators. Pop., 1890, 21,842.

Oswego-Tea. *Monarda didyma.* Odorous herb of the Mint family, native of N. America, often cultivated; known as Bee-balm.

Osweo, or OSWY. King of Northumbria 642–670. He conquered Penda of Mercia 655, and called the council of Whitby 664, which committed England to Roman Christianity.

Otariadæ. Family of *Pinnipedia*, including the Eared Seals or Sea Lions; *e.g.*, the Alaskan Fur Seal (*Callorhinus*).

Otfried. German poet of 9th century, author of a versified paraphrase of the Gospels.

Othman, ab.575–655. Son-in-law of Mohammed; 3d caliph 644.

Othman, or **Osman**, AL GHASI, 1259–1326. Founder of Ottoman empire; commander under Sultan of Iconium 1280; ruler of Bithynia 1299. Conqueror of much of Asia Minor.

Othman II., 1604–1622. Sultan 1617; deposed and slain by janissaries.

Othman III., 1700–1757. Sultan 1754.

Otho, MARCUS SALVIUS, 32–69. Comrade of Nero; Gov. of Lusitania 58–68; noted for vigor and profligacy; sharer of Galba's revolt; Emperor for 95 days; defeated and slain by Vitellius.

Otho (or OTTO) I., "THE GREAT," 912–973. Son and successor of Henry I.; King of the Germans 936; crowned as Emperor at Rome 962. He waged many wars, extended his empire widely, and with it the nominal dominion of Christianity.—His son, OTHO II., 955–983, Emperor 973, was an active ruler and conqueror.—His son, OTHO III., 980–1002, succeeded him.

Otho III.

Otho IV., 1175–1218. Son of Henry the Lion; emperor of Rome 1198–1212.

Otho, 1815–1867. Son of Louis of Bavaria; King of Greece 1832; deposed 1862.

Otho of Freising (BAVARIA), ab. 1114–1158. Bp. 1137; grandson of Henry IV.; author of two Latin histories, *Two States* and *Deeds of Frederick.*

Otis, FESSENDEN NOTT, M.D., LL.D., b. 1825. Prof. New York Coll. of Physicians and Surgeons 1871; writer on urinary diseases.

Otis, GEORGE ALEXANDER, M.D., 1830–1881. Surgeon U.S.A. from 1861; professional writer.

Otis, JAMES, 1725–1783. Patriot at Boston, eminent for oratory and resistance to search-warrants; permanently injured 1769 by British officers. *Rights of the Colonies*, 1764.—His nephew, HARRISON GRAY, 1765–1848, was M.C. from Mass. 1797–1801, U. S. Senator 1817–22, Mayor of Boston 1829, and a noted orator.

Otitis. Inflammation of the ear in any part. The most frequent seat of the disease is the middle ear, as the earache and gatherings in the ear so frequently noticed, especially in children. It frequently accompanies diphtheria and scarlet fever. The condition is always a serious one, apt to terminate in a chronic discharge (otorrhea) or in difficulty of hearing, and not infrequently will cause death. A disease of such danger cannot be safely left to domestic remedies. It is unwise to drop fluids in the ear, especially if one of the ingredients is a vegetable or animal oil. A douche of hot water, the application of cloths wrung out of hot water or a Japanese handstove to the external ear will usually relieve the intense pain. The discharge should be washed away by gentle syringing with a warm boric-acid solution. Further treatment than this is unsafe unless directed by a physician.

Otocardia. See MOLLUSCA.

Otoconia. See OTOLITH.

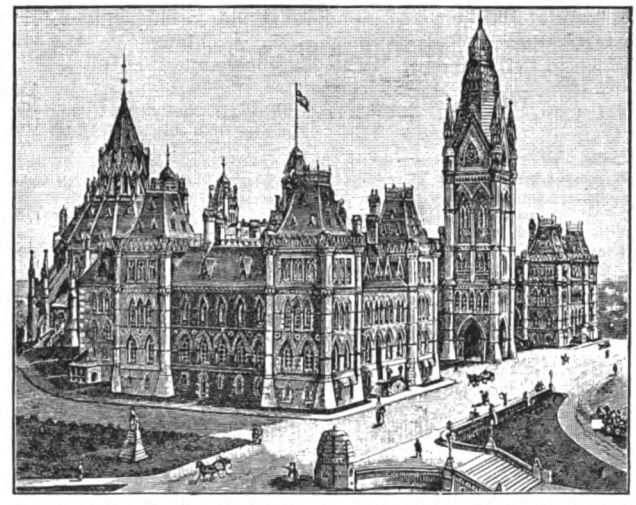
Otocyst. Capsule, or spherical chamber, in *Medusæ*, etc., containing otoliths.

Otolith. Calcareous nodule, usually lying loose in an otocyst, suspended in a fluid and in contact with certain hairs that connect with nerves. They serve both as organs of hearing, transmitting vibrations, and of equilibrium, by giving various stimuli of pressure according to the position of the body.

Otoporp. Meridional extension of nettle-cells from the bases of the tentaculicysts to the exumbrella of certain of the *Scyphomedusæ* (Jelly-fish).

Otsego Lake. Source of the Susquehanna, in O. co., N. Y.: celebrated in Cooper's novels. Length 8 m.

Ottawa. Capital of Canada, in Ontario, on s. bank of the O. River; founded 1826, and called Bytown till chartered



Canadian Parliament Buildings, Ottawa—The Main Building.

1854; seat of government since 1858; divided by the Rideau Canal. It has an extensive lumber trade. Pop., 1891, 44,154.

Ottawa Indians. Canadian Algonquin tribe, near Lake Huron; driven w. of Lake Superior by the Iroquois 1649–80, befriended by the Objibways and driven back e. by the Sioux. There are now ab. 1,000 in Canada, and a few with the Shawnees in Indian Territory.

Ottawa River. In Canada, rising in the highlands between the Great Lakes and Hudson's Bay, and flowing into the St. Lawrence near Montreal. Length ab. 800 m.

Ottendorfer, OSWALD, b. 1826 in Moravia. Partaker in German revolts 1848; in New York from 1850; ed. *Staats-Zeitung* from ab. 1859; active in reform and beneficence.

Otterbein, PHILIP WILLIAM, 1726–1813. German Reformed missionary in America 1752; founder of the United Brethren in Christ 1800.

Otterbein University. Founded 1847 at Westerville, Ohio, by United Brethren. It offers preparatory, classical, and philosophical courses, and has 15 teachers and ab. 300 students.

Otterburn. Village of Northumberland, where Henry Percy (Hotspur) fought the Scots under Douglas Aug. 19, 1388. This battle is celebrated in the ballad *Chevy Chase.*

Otters. Animals of genus *Lutra* and family *Mustelidæ;* aquatic, fish-catching *Carnivora*, with webbed feet, burrowing in the banks of ponds and streams. The Old World otter

Otter (*Lutra vulgaris*).

(*L. vulgaris*) is 2 ft. long, and has been trained to catch fish for man. The American otter is 4 ft. long, exclusive of the long, flattened tail. It is brown, and has a peculiar pad on the nose.

Otto. See OTHO.

Ottocar, 12th cent. German chronicler.

Ottocar II., ab.1230–1278. Son of Wenceslas I.; King of Bohemia 1253; conqueror of Prussia and Hungary; defeated and slain by Rudolph.

Ottoman Empire. See TURKEY.

Otto of Roses. See ATTAR OF ROSES.

Ottrelite. Hydrous aluminium iron silicate, occurring in the form of hard crystalline scales in many clay schists.

Ottumwa. Capital of Wapello co., Iowa, on the Des Moines, in a coal region. It has extensive manufactures. Pop., 1890, 14,001.

Otway, THOMAS, 1651–1685. English dramatist, eminent in tragedy. *Don Carlos*, 1676; *The Orphan*, 1680; *Venice Preserved*, 1682.

Ouabain. $C_{30}H_{46}O_{12}$. Poisonous glucoside from the wood of *Carissa shimperi*, growing in Africa. It acts on the heart like digitalis. One of the arrow poisons.

Oubliette. Doorless dungeon, reached by ropes from above.

Oude, or OUDH. Ancient state of n. India, long subject to Delhi; annexed by Gt. Britain 1856; prominent in the Sepoy mutiny 1857. Area 24,217 sq.m.; pop., 1891, 12,650,831.

Oudenarde. Belgian town, on the Scheldt; scene of a French defeat, July 11, 1708, by Marlborough and Prince Eugene.

Oudinot, CHARLES NICOLAS, 1767–1847. French general, distinguished at Ostrolenka, Friedland, Wagram, and the Beresina; Marshal and Duke of Reggio 1809; Peer 1815.—His son, CHARLES NICOLAS VICTOR, 1791–1863, led the French expedition against Rome 1849.

Oudry, JEAN BAPTISTE, 1686–1755. Painter of the French School. At first he painted historical subjects and portraits.

The Wolf at Bay, by Oudry.

then devoted himself to painting animals, especially dogs. He became court painter to Louis XV.

Ouida. See DE LA RAMÉ, LOUISA.

Ouless, WALTER WILLIAM, b. 1848. English portrait-painter; Academician 1881.

Ounce. Leopard-like animal of genus *Felis*, inhabiting the mountain heights and colder parts of Asia. It is 4 ft. long, besides the long tail. The color is yellowish gray, with black spots and rings. A mane is present.

Ounce. Twelfth of a pound in Troy weight, sixteenth in avoirdupois.

Ouray, 1820–1880. Chief of the Uncompahgre Utes in Col.; civilized, pacific, friendly and useful to U. S. Government.

Ourique. Town of Portugal; scene of a defeat of five Saracen kings and a great Moorish army, July 25, 1139, by Alfonso, who became king.

Ouseley, SIR WILLIAM, LL.D., 1769–1842. English Oriental scholar, who published a number of works upon Persian and Arabic literature and history. *Travels in Persia*, 1819–23.—His son, SIR WILLIAM GORE, D.C.L., 1797–1866, diplomatist and author, was long in S. America.—His cousin, SIR FREDERICK ARTHUR GORE, 1825–1889, Prof. of Music at Oxford 1855, founded a college for choristers, composed oratorios and anthems, edited several music books, and wrote on harmony, counterpoint, and fugues.—His father, SIR GORE, 1770–1844, diplomatist and Orientalist, wrote on *Persian Poets*, 1846.

Outbye. Passage leading from a mine.

Outcrop. Ledge or mass of rock at the surface or above it, generally forming the edge of a stratum or mineral deposit, which from that point disappears beneath other formations.

Outlaw. One adjudged to be out of the law's protection. In the U. S. this punishment is confined to traitors.

Outlier. Outstanding mass of rocks resulting from circumdenudation.

Output. Yield of a mine, estimated by day, month, or year.

Outram, SIR JAMES, 1803–1863. British officer, in India from 1819; defender of Hyderabad 1843; commander in Persian war 1856–57; associated with Havelock in relieving Lucknow Sept. 1857, and Sir Colin Campbell in its recapture March 1858; Lieut.-gen. and Knight 1858.

Outside, or OUTER EDGE. Figure in skating, in which the skater rolls on the outer edge of the runner, and thus describes curves and circles.

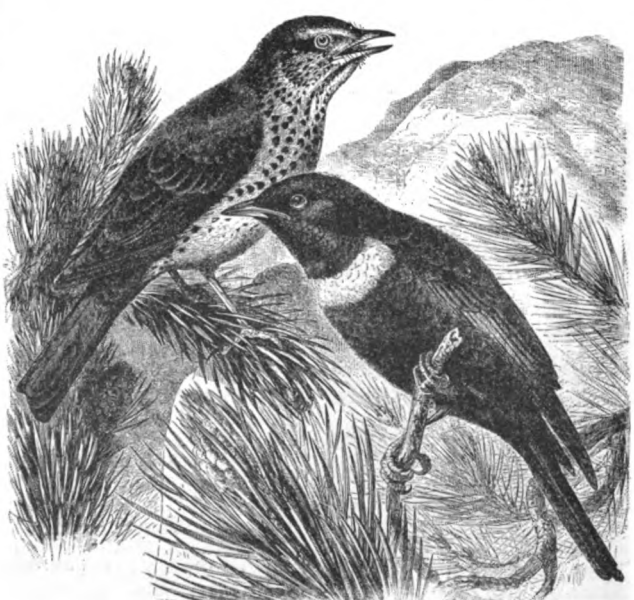
Ouvarovite, or UVARAVITE. $Ca_3Cr_2Si_3O_{12}$. Variety of garnet containing chromium; chrome-garnet.

Ouvrard, GABRIEL JULIEN, 1770–1846. French contractor and financier, imprisoned 1808–13 and 1823–28. *Mémoires*, 1826.

Ouvrard, LÉON FRANÇOIS, 1767–1826. French ethnologist.

Ouvrier, PIERRE GUSTAVE, 1765–1822. French traveler in America. *Hist. des Etats-Unis*, 1819.

Ouzel, or OUSEL. Originally, European Blackbird (*Merula*). It has a yellow bill. The Ring-ouzel (*Turdus torquatus*) is a



Thrush (*Turdus musicus*) and Ring-ouzel (*Turdus torquatus*).

thrush, black, with a white collar, living in mountainous regions. The Water-ouzel (*Cinclus*) or Dipper is a diving Os-

cine bird, related to the wrens: it seeks its food on the bottom of swift brooks. Species of this genus occur in both hemispheres.

Oval. 1. Re-entrant curve having two foci, the distances from which to any point in the curve have a constant relation. The noteworthy ovals are the Cartesian and Cassian, each having several peculiar specific forms. 2. Figure formed by intersecting arcs of circles.

Ovalo AND **Cavetto.** Molding whose outline is the quadrant of a circle: when convex it is an ovalo, when concave a cavetto.

Ovampo. Bantu people of w. Africa, in the German territory, s. of the Cuanene.

Ovando, NICOLAS DE, 1460–1518. Governor of Hispaniola 1502–9. He refused shelter to Columbus in a storm, and nearly exterminated the natives.

Ovariotomy. Operation to remove an ovary. It is indicated when it is diseased (*i.e.* ovarian tumor) or when there is a reflex neurotic condition due to a hyper-sensitive condition without evidence of organic change in the organ. Ephraim M'Dowell, of Ky., first removed an ovarian tumor 1809. The removal of the ovaries and Fallopian tubes is now a frequent operation and is generally successful.

Ovary. Lowest portion of the pistil of flowers, containing the ovules.—Organ in animals which produces the eggs, or ova. In a woman there are two, 1½ in. long, ¾ in. wide, and ½ in. thick, on either side of the uterus, to which they are connected by the Fallopian tubes, through which the ova pass to the uterus. At the time of menstruation the ova pass into the ovary by the rupture of the Graafian follicle in the cortical coating of the ovary, in which they mature. This coating is estimated to contain 30,000 ova. The ovaries are analogous to the testes of the male, and the ova are impregnated in the uterus. They are endowed with a generous nerve supply, and are frequently the cause of obscure nervous affections.

Ovate. Leaves or other organs which resemble in outline the longitudinal section of an egg, being broadest below the middle and not more than twice longer than wide, as in the Apple leaf.

Ovation. The Romans honored a victorious general either with the TRIUMPH (q.v.), or by the Ovation, wherein the general entered the city on foot, clad in a magisterial robe and wearing a myrtle crown. A sacrifice closed the ceremonies.

Oven. Chambers in which objects are baked by artificial heat. The early Egyptian oven was a crock sunk in the ground and heated by a fire built inside. The old type of baker's oven was a brick chamber, domed. Fire was made inside, and when the oven was sufficiently heated the ashes were raked out and the dough put in with a long wooden spade. Now most ovens are heated by fires built in a firespace, by superheated steam in pipes, or by gas. Loaves found in a Pompeiian bakery indicate that the name of the meal was stamped on bread.

Overbeck, FRIEDRICH, 1789–1869. German religious painter, important historically but weak as an artist, although distinguished for beauty of composition, simplicity of expression, grace, and deep religious feeling.

Christ Blessing Little Children, by Overbeck.

Overbeck, JOHANN ADOLF, b. 1826 at Antwerp. Prof. Leipzig 1858; writer on Greek art and antiquities.

Overbeek de Meijer, GILLIS VAN, b. 1831. Prof. Utrecht 1877; medical writer.

Overberg, BERNHARD, 1754–1826. German R.C. theologian.

Overburden. In Mining, superficial waste rock that has to be removed in open workings.

Overbury, SIR THOMAS, 1581–1613. English author, knighted 1608; imprisoned in the Tower, and poisoned there. *Characters*, 1614.

Overhand. Operations in which the miner stands under the rock he is excavating.

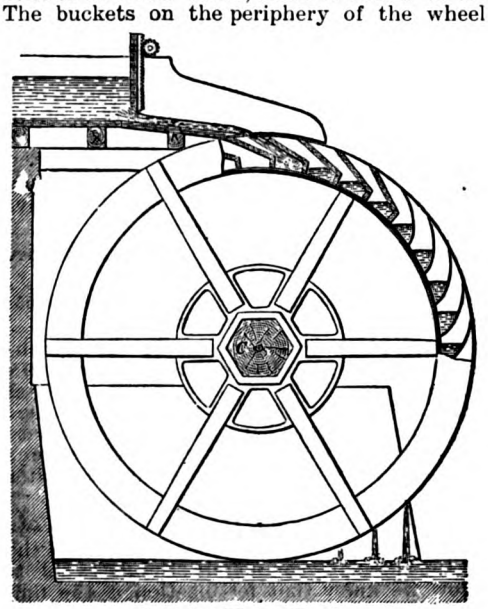
Overland Route. 1. From Europe to Asia, via Egypt, before opening of Suez Canal, as opposed to the voyage around Africa. 2. To California by the plains, prior to construction of Pacific R.R., as against the voyage around Cape Horn.

Overlap. In Geology, when the newer or more recent members of a formation extend beyond the beds below, of the same series, the former are said to overlap the latter.

Overproduction. Excess of production in certain lines, or production the ready distribution of which is prevented by some imperfection in the organization of exchange.

Overreaching. Said of a horse when he throws his hind foot against the heels or sole of the forefoot. Long hoofs or large toe-calks on the fore feet will cause the trouble.

Overshot Water Wheel. Water wheel or motor in which a wheel of large diameter is mounted on a horizontal axis, and the water is laid on without head at a point just below the upper end of the vertical diameter in the direction in which the wheel is to turn. The water acts therefore by its weight alone to turn the wheel, since it comes to it without shock. The buckets on the periphery of the wheel should nearly fill with water, and should be of such a shape as not to be emptied too soon on the lower part of the arc. The length of the wheel varies with the amount of power required and water available; the diameter depends on the height of the fall of water. This type of wheel is cumbrous and costly, and slow-moving. It has been largely replaced by the turbine wheels. Its efficiency is from 70 to 90 per cent. One at Laxey, England, is 72½ ft. in diameter and furnishes ab. 150 H.P.



Overshot Water Wheel.

Overskou, THOMAS, 1798–1873. Author of Danish comedies, and historian of the *Danish Theater*, 7 vols., 1854–76.

Overstone, SAMUEL JONES LOYD, LORD, 1796–1883. M. P. 1819, Baron 1850; writer on Bank of England.

Overt Act. Attempt to commit a crime.

Overtones. So-called partial tones which accompany the fundamental tone in the complex sensation known as a clang. They are caused by the partial vibrations of the body whose complete vibration gives the fundamental tone. The number and variety of the overtones give the distinguishing quality or timbre to tones, voices, or musical instruments. They include the harmonic overtones or harmonics, and may include certain tones which are inharmonic.

Overture. Opening musical piece of a drama, especially a lyric drama or opera. Originally it was vocal, and the first instrumental introductions were written in the vocal style. In its perfection it adopted the sonata form, and this was maintained in the overtures whose themes were borrowed from the operas which they introduced. The best of the overtures of Beethoven, Wagner and others seek to convey the emotional contents of the dramas with which they are associated.

Overweg, ADOLF, 1822–1852. German explorer of central Africa.

Overyssel (TRANSISULANIA). Dutch province e. of Zuyder Zee; formerly an independent state. Its coinage was abundant 1560–1770, as was that of its cities, Zwolle, Campen, and Deventer, in 17th century. Area 1,291 sq. m.; pop., 1893, 302,508.

Ovicell. 1. Case containing ova, especially during development; *e.g.*, oœcia of *Bryozoa*. 2. Synonym for ovum.

Ovid (PUBLIUS OVIDIUS NASO), 43 B.C.–18. Latin poet of the court of Augustus. Here he associated with the writers of the Golden Age, and composed his chief works. Falling into disfavor with the Emperor, he was banished to Tomi on the Black Sea, where he died. While less dignified and reverent than Virgil, he had great versatility and recognition of outward beauty. The *Metamorphoses* and *Heroides* give many charming mythological stories, and the *Amores*, *Tristia*, *Epistles*, and other minor works are graceful and sensuous.

Ovidæ. Sheep family of the Cavicorn Ruminants, including the Goat (*Capra*), Ibex, and Sheep (*Ovis*).

Oviduct. Passage through which the ovum leaves the ovary; it leads to the uterus in mammals.

Oviedo. Ancient town of n.w. Spain, 20 m. from Bay of Biscay. It has a fine cathedral, begun 781, and a university, founded 1574. Pop. ab. 43,000.

Oviedo y Valdez, GONZALO FERNANDEZ DE, 1478–1557. Historian of the Spanish conquests in the New World, 1526–35, tr. 1555.

Ovipara. Group of *Diptera*, including *Coarctatæ* and *Obtectæ*.

Ovipositor. Appendage at end of abdomen of female insects, by which the eggs are deposited. It is often long and adapted for piercing into the tissues of plants and animals in which the larvæ are parasitic; it is then called a terebra. Or it may be adapted for sawing (serra), or be a sting (aculeus).

Ovisac. Sac-like structure in which many Invertebrates carry their eggs after they are extruded.

Ovolo. Convex molding having an egg-shaped outline: especially applied to the Doric capital.

Ovotestis. Reproductive organ which produces both ova and spermatozoa, as in certain snails.

Ovoviviparous. Producing young alive which originally are derived from eggs; word now restricted, since all viviparous animals are also egg-producers. Oviparous indicates that the development of the young takes place outside the body, the eggs being laid or spawned before the young are hatched, as in Fishes and Reptiles. But in these groups there are exceptional species in which the young develop within the maternal body; to such the above term strictly applies.

Ovules. Embryonic seeds contained in ovary of flowers.

Ovulist. One who believed that the ovum is the essential germ and the spermatozöon merely stimulates this to development. Now we know that fertilization is the union within the egg (which is a cell enlarged by being filled with food for the embryo) of two similar and equal nuclei, one derived from the body of the female, the egg nucleus, and one from the male, the spermatozöon. See FERTILIZATION and POLAR GLOBULES.

Ovum. The cell secreted by the ovary, consisting essentially of protoplasm and a nucleus.

Owen, DAVID DALE, M.D., 1807–1860. Son of Robert; in U. S. from 1828. He began 1837 the Geological Survey of Indiana; pub. 1839 a work on the mineral lands of Iowa; conducted 1848–50 a survey of Iowa, Wis., and Minn.; also of Ky. 1854–57 and Ark. 1857–60.

Owen, JOHN, 1560–1622. English author of Latin *Epigrams*, 1606, tr. 1619.

Owen, JOHN, D.D., 1616–1683. English Puritan of high repute; Chaplain to Cromwell 1649, Dean of Christ Ch., Oxford, 1651–60, Vice-Chancellor 1652–57; author of 80 books. He declined the presidency of Harvard 1670.

Owen, JOHN, d. 1896. English author. *Evenings with Skeptics*, 1881.

Owen, JOHN JASON, D.D., LL.D., 1803–1869. Teacher in N.Y.; editor of Homer, Xenophon, and Thucydides.

Owen, SIR RICHARD, LL.D., D.C.L., F.R.S., 1804–1892. English comparative anatomist and paleontologist, knighted 1883. Besides *Fossil Organic Remains*, *Odontography*, 1840, *Hist. British Fossils, Mammals, and Birds*, 1846, and *Fossil Reptiles*, 1849–51, he wrote much on extinct animals of the principal British colonies.

Owen, RICHARD, LL.D., 1810–1890. Son of Robert; in U. S. from 1828; engaged in survey of N. W. Territory 1848; State Geologist of Indiana 1860; prof. Univ. Indiana 1864–79. His chief geological work consisted in seismic investigations and speculations on the land masses of the globe.

Owen, ROBERT, 1771–1858. Welsh social reformer; cotton manufacturer in Scotland, where he introduced many reforms in the treatment of his employés. In his works, *New View of Society*, 1812, and *New Moral World*, 1836, he advocated advanced socialistic views, which he endeavored to put into practice at New Harmony, Ind., 1824. He failed in this, and in subsequent attempts in England. His opinions were shared by his eldest son, ROBERT DALE, LL.D., 1800–1877, who remained in the U. S., became M.C. 1843–47, Minister to Naples 1855–58, and a prolific writer. *Footfalls on the Boundary of Another World*, 1859, and *The Debatable Land*, 1872, are in the Spiritualist interest.

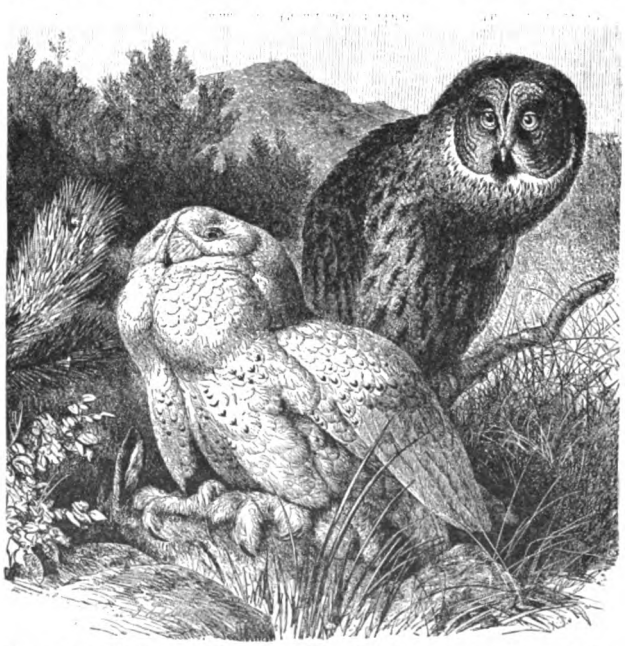
Owens, JOHN EDWARD, 1824–1886. Anglo-American actor and manager, best known from 1864 as "Solon Shingle."

Owens College. At Manchester; named from John Owens, its founder, who died 1846, bequeathing nearly £100,000 as endowment. It was opened 1851 for arts, science, law, and medicine, and imposes no religious tests. A local Workingmen's College was incorporated with it 1861. It affiliated with others in the Victoria Univ., chartered 1880.

Owen Sound. Town of Ontario, Canada, at the head of a long bay of the same name off Georgian Bay. Pop., 1890, 7,500.

Owen's River. In s.e. Cal., flowing through a desert valley, discharging into O. lake, whose water is strongly impregnated with salt and carbonate of soda. The lake has no visible outlet.

Owls. Raptatorial birds of family *Strigidæ*, including 100 species and numerous genera. They have large eyes, looking forward, encircled by stiff feathers, and with vertical pupil. Most are nocturnal and see poorly by day, but *Surnia*, the Hawk Owl, and *Nyctea*, snowy owls of arctic regions, feed by day. Their food consists of rodents, insects, birds, vermin, and fish. The Great Horned Owl (*Bubo virginianus*) attains a wt. of 8 lbs., and attacks poultry. Owls hear well; some, *e.g.* *Asio otus*, have a well developed feathered concha. The long ears, by which *A. otus* is known, refers to the horns of feathers, developed above the eyes. Owls fly noiselessly, owing to their soft plumage. The feet have usually a feathered tarsus; the outer toe is reversible, and in the Fishing Owl the toes are



Snowy Owl (*Nyctea scandiaca*) and Bearded Owl (*Syrnium lapponicum*).

Osprey-like. The female is the larger. The size ranges from 6 in., Pygmy Owl (*Glaucidium*) of tropical forests, to 30 in., Great Gray Owl (*Syrnium*) of northern regions. Reddish brown is predominant, but dark and light colors may be exhibited by a single brood. The eggs are spherical and pure white. Some species breed before the snow has gone, and their eggs hatch a few at a time. *Athene noctua*, the Little Owl of Europe, is the symbol of learning. *Speotyto*, the Burrowing Owl, lives in the burrows of Prairie-dogs of N. America, or Cavies of S. America, on whose young it feeds, in part, while Rattlesnakes associate with both as a common enemy. *Aluco flammeus*, the Barn Owl, differs from other owls in lacking a manubrium to the

sternum, and in having its clavicles joined as a furcula to the keel.

Ownership. Legal right to a thing, or interest therein, to the exclusion of all others.

Ox. See BOVIDÆ.

Oxalic Acid. COOH.COOH. Simplest organic dibasic acid, occurring in many plants, *e.g.* the oxalis, as potassium salt, and in others, *e.g.* rhubarb, as a calcium salt; white needles, which decompose on heating. The sodium salt is prepared by fusing together sawdust and caustic soda. The commercial acid is prepared from this salt. It is used in dyeing and calico printing, and is poisonous.

Oxalic Ether. $(COO)_2(C_2H_5)_2$. Ethyl oxalate; liquid; bpt. 186.1° C. (cor), having an aromatic odor; prepared from oxalic acid and alcohol.

Oxalis. Wood-sorrel. Genus of small, showy-flowered herbs of the Geranium family, of wide geographical distribution. Some of them are cultivated for ornament.

Oxaluria. Name given to a supposed diseased condition in which calcium oxalate is present in the urine. A distinct disease is denied by many, and the abnormal condition of the urine is asserted to be but a symptom of some form of dyspepsia. As it occurs largely in the nervously depressed or gouty, this probably is the correct view.

Oxalyl. Group or radical. C_2O_2; derived from oxalic acid by the removal of two OH groups.

Oxamide. $(CONH_2)_2$. White crystalline powder, which sublimes and partially decomposes on heating; made by treating oxalic ether with ammonium hydroxide.

Oxea. Spicule, which is a rhobdus pointed at both ends; found in the sponge genus *Rosella*.

Oxenden, ASHTON, D.D., b. 1808. Bp. of Montreal 1869–78, rural dean of Canterbury 1879–84; author of many popular devotional books.

Oxenford, JOHN, 1812–1877. English dramatist and translator; dramatic critic of the London *Times* from 1846.

Oxenham, HENRY NUTCOMBE, 1829–1888. English R. C. divine from 1857. *Atonement*, 1865–81; *Eschatology*, 1876.

Oxenstierna, AXEL, COUNT, 1583–1654. Chancellor of Sweden 1611; powerful under Gustavus Adolphus; negotiator of several treaties; head of the Protestant League 1633; guardian of Queen Christina; ablest statesman of his time.

Ox-Eye. Yellow-flowered coarse herbs of the genus *Heliopsis*, of the Composite family, natives of e. N. America.

Ox-Eye, SEA. Shrubs of the genus *Borrichia*, natural family *Compositæ*, growing on the seacoast of the s.e. U. S. and the W. Indies.

Ox-Eye Daisy. See DAISY.

Oxford. City of Oxfordshire, on the Thames (or "Isis") and Cherwell, 52 m. w.n.w. of London; long famous for its university, chartered 1201. Here Latimer, Ridley, and Cranmer were burned 1555–56. Pop., 1891, 45,741.

Oxford, ROBERT HARLEY, EARL OF, 1661–1724. M.P. 1690; Speaker 1701; Sec. of State 1704; Chancellor of Exchequer 1710; Earl and High Treasurer 1711–14; impeached 1715, and in prison till 1717; at first a Whig, later a high Tory; founder of the Harleian library or collection.

Oxford University. There was an academy here in 802, but organized teaching cannot be traced back of 1133. It was chartered by Henry III. 1248, by Henry VIII. 1510, and incorporated by Elizabeth 1570. It has 23 colleges, of which 14 antedate the Reformation, and 6 halls. University Coll., founded 1249, is accounted the oldest, but Merton was the first to receive its statutes, 1264, and has the oldest library in England. 1858 saw many reforms in both Oxford and Cambridge; 1871, the abolition of religious tests, and 1877, the removal of nearly all remaining discriminations against dissenters. The number of undergraduates increased from 1,526 in 1862 to 3,365 in 1896; at the last date it had 95 on the teaching staff. Local examinations were initiated 1858; University extension began in Cambridge 1867.

Brasenose College, Oxford—The Quadrangle (showing also Spire of St. Mary's and Dome of Radcliffe Library).

Ox-gall. Bile or bitter fluid secreted by the liver of the ox. It is used for scouring cloth, cleansing carpets, and, when refined, by artists in mixing colors.

Oxidation. Union of oxygen with other substances. In a wider sense the term is applied to chemical changes resulting in the addition of negative radicles, simple or compound, to elements or compounds; or a decrease in the relative quantity of the positive radicle of a compound, whether or not accompanied by the substitution of negative radicles.

Oxide, ORGANIC. $(CH_2)_2O$. Regarded as derived from water, H_2O, by replacement of the two hydrogen atoms by two similar or different radicals. Other oxides are known as ethylene oxide. See ETHERS.

Oxides. Compounds formed by the union of oxygen with some other element. Acid oxides are those which, when treated with water, yield acids (anhydrides); *e.g.*, sulphur trioxide. Basic oxides, when treated with water, yield a base; *e.g.*, sodium oxide.

Oxidizing Agent. Substance which will readily give up its oxygen to another substance.

Oxley, JAMES MACDONALD, b. 1855. Canadian author of law-books and stories for boys.

Ox-Lip. *Primula elatior*. Showy-flowered herb of the Primrose family, native of Europe; cultivated for ornament.

Oxus, or AMOO DARIA. River of w. Asia. It heads in the Hindu Kush Mts., and flows n.w. to the sea of Aral. Length 1,600 m.

Oxyacids. See HYDROXYACIDS and ACID.

Oxydactylia. Tribe of *Phaneroglossa*, including forms with the toes pointed. Two groups are distinguished: *Raniformia* (Frogs), and *Bufoniformia* (Toads). The *Ranidæ* are Water Frogs with webbed toes and hind feet formed for jumping. The *Pelobatidæ* are Land Frogs, which resemble Toads, but have teeth on the maxillaries: *Bombinator* is an example. Toads (*Bufo*) have no teeth, are of clumsy form, the legs nearly equal in length, and the skin warty.

Yellow-bellied Frog (*Bombinator pachypus*).

Oxygen. O. At. wt. 16, sp. gr. 1.105, valence II. Discovered by Priestley 1774: colorless, odorless, tasteless gas, slightly soluble in water, forming eight-ninths of water, one-fifth of the air, and almost half of the solid earth; first obtained by the decomposition of mercuric oxide by heat. This is a convenient way of preparing it in small quantities; a better and cheaper method consists in heating a mixture of one part of manganese dioxide and two of potassium chlorate. It is made in large quantities for use in the oxyhydrogen-blowpipe, Drummond Light, etc. It combines with all elements except fluorine, and is a constituent of almost all acids and all bases. It is liquefied at —118° C. and 50 atm.; the liquid is bright blue, sp. gr. .9.

Oxygenated Water. See HYDROGEN DIOXIDE.

Oxyhemoglobin. HEMOGLOBIN (q.v.) containing a definite quantity of oxygen in loose combination, giving it a bright red color. It is found normally in the red blood-corpuscle and more abundantly in the arterial blood. The change of color, after the blood has gone through the capillaries and entered the veins, is due to some of the oxyhemoglobin giving up its oxygen in the tissue for the various bio-chemical processes and becoming hemoglobin, which again changes to oxyhemoglobin in the lungs. It requires an amount of oxygen equivalent to 1.76 c.c. at 0° C. and bar. 760 mm. to change one gm. of hemoglobin to oxyhemoglobin, and this proportion is constant. See CIRCULATION OF THE BLOOD, BLOOD, and RESPIRATION.

Oxyhydrogen Blowpipe. Apparatus for producing intense heat. The oxygen and hydrogen are led from two different sources to a jet consisting of a tube for the delivery of the oxygen, with a larger tube around it, the hydrogen being brought in through the annular space. Sometimes the gases are mixed in the body of the blowpipe. Invented by Dr. R. Hare in 1801. See DRUMMOND LIGHT.

Oxyrhyncha (MAJACEA). See CRABS.

Oxystomata. See CRABS.

Oxytricha. Genus of *Hypotricha*. It has cilia and bristles on the under side, by which it can walk over the surface of submerged objects, as plant stems.

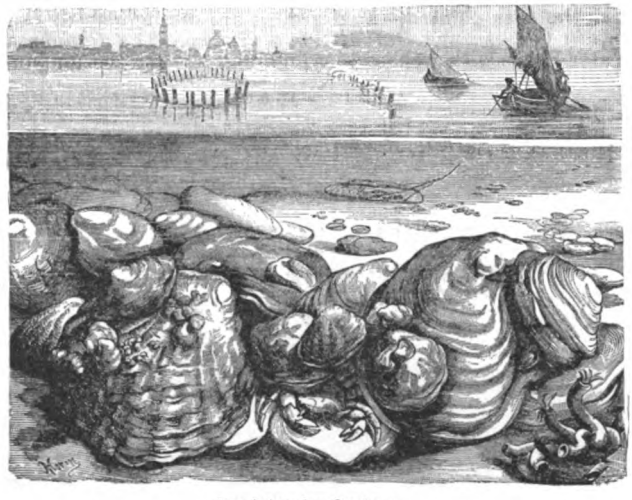
Oxyuris. Pin-worm infesting the rectum of children. The females are larger than the males. See ASCARIDÆ.

Oyer. Hearing an instrument read on which an action was brought.—OYER AND TERMINER. Court of original jurisdiction over important crimes.

Oyster. See OSTREIDÆ.

Oyster-Catcher (HÆMATO PUSPALLIATUS). Shore bird (see LIMICOLÆ) having short bright-colored legs, toes three-webbed at the base, a bill 3 in. long, and body 18 in. The upper parts are blackish, white beneath. It feeds on crustacea, not on oysters.

Oyster Culture. Artificial rearing of oysters for the market dates from the Roman period or even earlier, but only in America has it assumed vast proportions; 28,263,847 bushels, worth $16,152,257, being marketed in 1892, four-



Dredging for Oysters.

sevenths from Maryland and Virginia. The natural bed where the oyster matures of itself is a bottom containing shells or gravel to which the young can attach themselves, and is so situated as to receive the washings of rivers at every low tide, bringing food (principally diatoms) into the sea, for the oysters. These beds are public, and any one can take oysters from them: the consequence is that they are fast being destroyed. At present the oysters taken from them are too small for market, being less than a year old. They are seed, which the oyster-planter procures and places upon designated areas to fatten for market. Large market oysters are four or five years old, and have been in the planter's care three or four years. The discovery by Brooks of the bisexuality of our oysters, makes it possible to breed them as we do fishes. See PISCICULTURE. The attempt to raise oysters from the eggs dates from the experiments of Coste in France 1858, although earlier experiments were known. As the French oyster, *Ostrea edulis*, is hermaphroditic and viviparous, it is possible to get a catch of spat on submerged sticks, tiles, or shells, only by planting this cultch near spawning oysters. A similar method of catching oyster spat is practiced on a large scale in the waters of Long Island Sound, oyster shells being planted as cultch. This method is resorted to as fast as the natural seed beds are depleted. It has been successfully introduced into Virginia waters. The American oyster, *O. virginiana*, is diœcious and oviparous; the germs of both sexes being spawned into the water to shift for themselves, great loss of possible seed results, so that experiments have been made to utilize this spawn by more artificial methods (especially by Claire-culture). The experiments have been successful, but oystermen have not yet applied these methods on a commercial scale.

Oyster-Plant. See SALSIFY.

Oyster-Shell Bark-Louse (MYTILASPIS POMORUM). Insect parasite of apple and other fruit trees, introduced into America from Europe. It lives under an oyster-shaped scale, $\frac{1}{8}$ in. long, of same color as the bark. Eggs hatch in spring, when a wash of strong soapsuds or kerosene spray may be employed as a remedy.

Ozanam, ANTOINE FRÉDÉRIC, 1813–1853. French historical writer and critic; prof. Sorbonne 1841. *Dante*, 1839; *Civilization in 5th Century*, 1845, tr. 1868; *German Studies*, 1847–49.

Ozark Hills. Area of broken country, rising in places to ridges and hills of considerable height, in s. Mo., w. Ark., and s. Indian Territory; most important in Ark., where they consist mainly of abrupt e. and w. ridges of quartzite, 1,000 to 3,000 ft. high.

Ozena. Form of nasal catarrh accompanied by an offensive discharge. The disease is disagreeable to possess and difficult to cure. It is the form largely dwelt upon in the circulars and advertisements of the venders of nostrums for catarrh.

Ozerof, VLADISLAS ALEXANDROVICH, 1770–1816. Russian tragic dramatist. *Œdipus and Athene*, 1804; *Fingal*, 1805; *Dimitri Donskoi*, 1807; *Polyxena*, 1809.

Ozokerite. Mineral wax; natural paraffin; substance consisting of carbon and hydrogen, and resembling wax or spermaceti in appearance, being nearly white when pure, but usually darkened by foreign matter. It was found in Moldavia 1833, in a bed of coal. Boryslaw, in Galicia, has been since 1859 the chief source of supply. Large deposits exist in Utah. It is widely used in the arts as a substitute for bee's-wax and in the manufacture of electrical insulators and candles.

Ozone. Allotropic form of oxygen, the molecule of which has the formula O_3; discovered by Schönbein 1840; blue gas of characteristic odor, occurring in minute quantities in the atmosphere, especially during electrical storms; made by passing a series of electric sparks through an atmosphere of oxygen; much more active than oxygen; strongly irritating to the throat membranes. At 270° C. it is converted into oxygen. It condenses to a blue liquid at —106° C.

Ozone Tests. Chemically prepared paper which, upon being exposed to the air, is changed in its tint if any ozone is present. Thallium hydroxide is turned brown, and faintly acid litmus paper with potassium iodide is turned blue.

Ozonometry. Art of measuring the quantity of ozone in the atmosphere.

P

Paca, WILLIAM, 1740–1799. Delegate to Congress 1774–79; signer of the Declaration of Independence; judge of Md. courts 1778–82; Gov. of Md. 1782–86; U. S. District Judge from 1789.

Pacchionian Bodies. Little bodies formed in connection with the middle membrane covering the brain (Arachnoid), which frequently contain chalky concretions that produce little depressions on the under side of the skull by their pressure.

Pace. See GAITS.

Pacheco y Osorio, RODRIGO, MARQUIS OF CERRALVO, d. ab.1650. Viceroy of Mexico 1624–35.

Pachomius, ab. 292–348. Egyptian monk, founder of the first monastery, on Tabenna in the Nile, ab. 340, and of the first nunnery. Before his time each monk was solitary. 7,000 of both sexes were under his care.

Pachuca. Mining town of Mexico, 56 m. n.e. of Mexico. Here Medina in 1557 discovered and used the patio process for the extraction of silver. The silver mines here were worked before the Spanish conquest. Pop., 1889, 32,800.

Pachydermata. See DIPLARTHRA.

Pachyglossa. See CRASSILINGUIA.

Pachymeres, GIORGIOS, 1242–ab.1310. Byzantine historian.

Pacificator, THE. Name given to PAUL FERRY (q.v.).

Pacific Ocean. Largest body of water on the globe, stretching from America to Asia and the E. India islands, a distance of 12,000 m., and from Bering Strait to the Antarctic Continent. Its area is ab. 67,500,000 sq. m., its mean depth ab. 2,500 fathoms, and maximum depth 5,000 fathoms. It contains vast numbers of small islands, some of which are volcanic in origin, others the work of coral polyps. It was first seen by Balboa at Darien 1513, and named by Magalhaes, who first sailed it 1520.

Pacific Railways. See RAILWAYS.

Pacini, GIOVANNI, 1796–1867. Italian composer of ab. 90 operas, popular only at home.

Pacinotti, ANTONIO, b. 1841. Italian electrician. The inventor 1860 of a dynamo-electric machine similar to that used later by Gramme.

Pacioli, LUCAS, d. 1510. Italian Franciscan, author of the earliest printed book on arithmetic and algebra. *Summa Arithmetica Geometria proporzioni e proporzionalita*, 1494.

Pacinian Corpuscles. Oval bodies about two mm. long in which a nerve fiber terminates. They are found in greatest abundance in those parts of the body where the sense of touch is most developed.

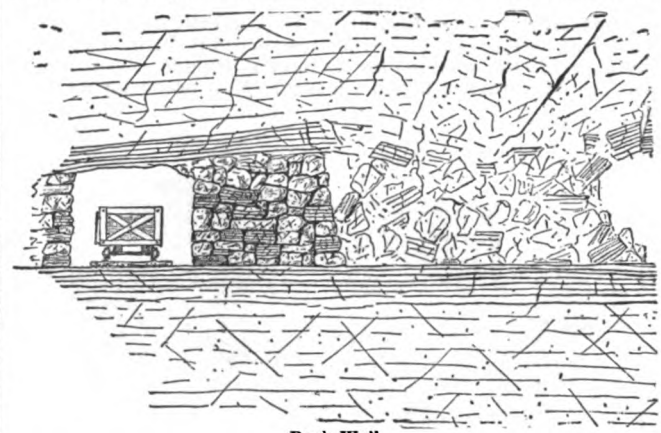
Packard, ALPHEUS SPRING, M.D., b. 1839. Prof. of Zoölogy and Geology in Brown Univ. 1878; most eminent as an entomologist; prolific writer.—His father, ALPHEUS SPRING, D.D., 1798–1884, was prof. Bowdoin Coll. from 1824, and its historian 1882.

Packer, ASA, 1806–1879. Builder and pres. Lehigh Valley Railroad; M.C. from Pa. 1853–57; founder of Lehigh Univ., to which he gave or bequeathed $2,500,000.

Packer, WILLIAM FISHER, 1807–1870. Gov. of Pa. 1858–61.

Packing. In Mechanics, materials used to prevent leakage where a moving piece has different pressures on the two ends of its surfaces of contact. For packing of pistons and plungers see those titles. For rods and valve-stems some form of fibrous material made from cotton is usual, either by itself or in conjunction with rubber, which gives elasticity. This is pressed in upon the rod by conical surfaces (see STUFFING BOX), with just pressure enough to give it a fluid tight contact with the moving rod, and yet without excessive friction. Metallic packings are also much used, and, when well taken care of, work satisfactorily. They are usually alloys of the type of Babbitt metal, and get pressure from springs and conical contacts. Cotton lamp-wick, canvas and rubber, paper and asbestos fiber, are bases of numerous packings.

Pack Wall. In Coal Mining, wall of stone or rubble, built along a gob road to hold up the roof; also used in the



Pack Wall.

anthracite regions synonymously with the English term chocks or nogs.

Pact. In Roman Law, agreement: if so made as to be legally obligatory, it was a contract; otherwise it was nude or naked. In English Law, a nude pact is an agreement without a legal consideration.

Pactolus. Brook of Lydia, w. Asia Minor. Crœsus was supposed to have been enriched by the gold-dust which it bore down from Mt. Tmolus.

Pacuvius, MARCUS, ab. 220–130 B.C. Roman dramatist, whose works were mostly adaptations from the Greek. Fragments remain.

Paddock, ALGERNON SIDNEY, b. 1830. U. S. Senator from Nebraska 1875–81 and 1887–93.

Paddock, BENJAMIN HENRY, D.D., 1828–1893. P.E. Bp. of Mass. from 1873, and historian of the diocese 1885.—His brother, JOHN ADAMS, D.D., 1825–1894, was P.E. Bp. of Olympia, Wash., from 1880.

Padella. Shallow vessel of metal or earthenware used in illuminations.

Paderborn. Old town of Westphalia, 50 m. s.w. of Hanover. It has a fine cathedral dating from 1163, and had a R. C. university 1614–1819. The coinage of its bishops was extensive ab.1600–1789. Pop., 1890, 17,986.

Paderewski, IGNACE JAN, b. 1860. Polish piano-forte virtuoso and composer; known in Europe since 1887. He made concert tours in America in 1891–92, 1893, and 1895–96.

Padilla, JUAN DE, d. 1521. Gov. of Saragossa; leader of a revolt against governmental oppression; hero of Spanish legends and plays, with his wife, MARIA, d. 1531.

Padishah. Title of Turkish and Persian sovereigns.

Padua. Ancient city of n. Italy, on the Brenta, 22 m. w. of Venice; birthplace of Livy; subject to Rome from 215 B.C.; twice sacked by Goths and Huns in 5th century; held by Venice 1405–1797, and then by Austria. Its university, founded 1221, has ab. 70 teachers, 1,400 students, and a library of 160,000 vols. The city has many old and fine buildings: its palace was completed 1219. Pop., 1892, 79,500.

Paducah. Capital of McCracken co., Ky., on the Ohio and Tennessee rivers; scene of battle, March 25, 1864, between Union troops with gunboats and 6,000 Confederates under Gen. Forrest. Pop., 1890, 13,076.

Pæan. Joyful or triumphant song, originally a hymn to Apollo.

Pædobaptists. Those who practice infant baptism; *i.e.*, the vast majority of Christians.

Pædogenesis. Production of young, parthenogenetically by a larva; observed by Wagner 1860, with a species of *Cecidomya*, which lives under the bark of trees. During the summer eggs develop parthenogenetically within the body of the larva, and the young consume their mother. Several summer-generations of this sort are succeeded in the fall by winter-generations, which attain sexual maturity. The cycle is begun again by the survivors the following spring.

Pæonine. See ROSOLIC ACID.

Pæonius, probably 5th cent. B.C. Sculptor of the *Victory* found at Olympia 1875.

Paër, FERDINANDO, 1771–1839. Italian composer of 43 operas; court conductor at Dresden 1802–6; imperial chapel-master in Paris under Napoleon.

Paesiello, GIOVANNI, 1741–1816. Italian composer of over 100 operas.

Pæstum. City of Lucania, s. Italy, on the Gulf of Salerno; colonized as Posidonia by Sybarites ab. 624 B.C.; held by Rome from ab. 272 B.C.; famed for its roses in time of Augustus; destroyed by Saracens in 9th century. Now noted for its ruins

Temple of Neptune at Pæstum.

of three Doric temples, first made known 1755; that of Neptune, so-called, is one of the oldest known, dating from 6th century B.C. These are the only remains of Greek temples in Italy in any fair state of preservation.

Paez, JOSÉ ANTONIO, 1790–1873. Pres. of Venezuela 1831–35 and 1839–43; imprisoned 1849–50; dictator 1861–63; long in U. S. *Autobiografia*, 1867.

Paganini, NICCOLO, 1782–1840. Most famous of violinists; b. in Genoa. His life was full of adventure. His studies and concert-pieces are still the high-water mark of technical accomplishment on the violin.

Paganism. Aggregate of religions which do not, with Christianity, Judaism, and Mohammedanism, acknowledge a personal God as historically revealed in Israel.

Page. Juvenile attendant on a prince or noble; formerly in training for higher service; now infrequent and merely ornamental.

Page, DAVID, 1814–1879. Scottish writer of popular and educational books on geology.

Page, DAVID PERKINS, 1810–1848. Principal of Albany Normal School, N. Y., 1844. *Theory and Practice of Teaching*, 1847.

Page, THOMAS NELSON, LL.D., b. 1853. Virginia author, eminent for negro dialect stories, especially *Marse Chan* and *Meh Lady*. *In Old Virginia*, 1887; *Two Little Confederates*, 1889; *The Old South*, 1892.—His great-grandfather, JOHN, 1744–1808, was M.C. 1789–97 and Gov. of Va. 1802–5.

Page, WILLIAM, 1811–1885. American painter of rare endowment and literary acumen. He did not wholly shake off Academic methods, and in these he lacked color harmony; but his work is always serious and masterly. He was an authority on portraits of Shakespeare, and his interest in the Kesselstadt death-mask brought it public appreciation.

Paget, SIR GEORGE EDWARD, M.D., LL.D., D.C.L., F.R.S., b. 1809. Medical prof. at Cambridge 1872; knighted 1885.—His brother, SIR JAMES, LL.D., b. 1814, was made Baronet 1871, and pres. College of Surgeons 1875. *Surgical Pathology*, 1853; *Clinical Lectures*, 1875.

Paget, VIOLET ("VERNON LEE"), b. 1857. English author, living in Italy. *Belcaro*, 1882; *Ottilie*, 1883; *Euphorion*, 1884; *Baldwin*, 1886.

Pagina. Surfaces of leaves and other organs.

Pagoda. Indian form of temple, generally square below, with a tower-shaped top, consisting of a sequence of stones of diminishing size and somewhat resembling a slender pyramid. In India and adjacent countries of e. Asia it is frequently in connection with a temple. Originally raised over relics of Buddha, the primal object has been lost sight of in China and

Pagoda at Tanjore, India.

Japan, where it has become an adjunct to certain native superstitions connected with geomancy. The pagoda at Tanjore is 182 ft. high.

Pahlavi, or PEHLEVI. Dialect of the Iranian or Persian family, with many Semitic elements. A version of the *Avesta* is preserved in this tongue. Its literature dates from the 3d century.

Pailleron, ÉDOUARD JULES HENRI, b. 1834. French dramatist and poet, Academician 1882. *Le monde ou l'on s'ennuie*, 1881.

Pain, BARRY, b. 1864. English humorist. *Stories and Interludes*, 1892.

Pain and Pleasure. Modifications of consciousness which defy accurate definition, but which, as some degree of feeling, probably accompany every state of mind and tend to produce characteristic volitional impulses. *E.g.*, pain arouses a tendency to repel, get rid of, or move away from the object or state which causes it, while pleasure causes an impulse to retain the pleasurable object or state. Physiologically, pain and pleasure depend distinctly upon modifications of the nervous system. The more important conditions giving rise to pain are excessive stimulation of sense organs, inflammation, and interference with natural appetites and impulses, while moderate sense stimulation and activity within certain limits are, as a rule, distinctly pleasurable. Sudden cessation of pain must also be regarded as a cause of distinct pleasure. Intellectual pains and pleasures depend not so much on nervous adjustment as on the relation of the painful or pleasurable percept to the individual's previous experience.

Paine, ELIJAH, LL.D., 1757–1842. Judge Vt. Supreme Court 1791–95; U. S. Senator 1795–1801; U. S. District Judge from 1801.—His son, MARTYN, M.D., LL.D., 1794–1877, prof. Univ. New York 1841–67, pub. *Institutes of Medicine*, 1847, and other works.—His brother, ELIJAH, 1796–1853, Judge N. Y. Superior Court from 1850, pub. *U. S. Circuit Court Reports*, 1827–56, and *Practice in Civil Actions*, 1830.

Paine, JOHN KNOWLES, b. 1839. American musician, prof. Harvard 1876; composer of an oratorio, *St. Peter*, several symphonies, a mass, performed 1867, cantatas, overtures, symphonic poems, chamber music, organ music, and incidental music to *Œdipus Rex*, performed at Cambridge 1881.

Paine, ROBERT TREAT, 1731–1814. Delegate to Congress 1774–78; signer of the Declaration of Independence; Atty.-gen. of Mass. 1780–90; Judge of Mass. Supreme Court 1790–1804.

Paine, THOMAS, 1737–1809. Radical writer on politics and religion, who came from England to America 1774, and pub. *Common Sense*, a pamphlet advocating independence, 1776; *The Crisis*, a periodical widely influential, 1776–83, and *The Rights of Man*, 1791–92. He was elected to the French National Convention 1792; was imprisoned by the terrorists nearly a year; resumed his seat in Convention after his release; issued *The Age of Reason*, 1795, and returned to the U. S. 1802. His deistical opinions alienated the sympathies of the religious public, and his last days were passed in obscurity. His memory has been rehabilitated by M. D. Conway, 1892, who has also edited his works, 4 vols., 1894–95.

Paine, WILLIAM H., 1828–1890. Captain of engineers 1861–65; resident engineer of construction of the Brooklyn suspension bridge.

Pains and Penalties. See ATTAINDER.

Painted-Cup. *Castilleia coccinea.* Scarlet-bracted herb of the natural order *Scrophulariaceæ*, native of e. N. America.

Painter, WILLIAM, ab.1525–ab.1595. English translator and compiler. His *Palace of Pleasure*, 1566–75, was taken from French and Italian sources, and was of use to Shakespeare.

Painter's Colic. Colic from lead poisoning; so called because frequently attacking painters. An OCCUPATION DISEASE (q.v.).

Painter's Cream. Mixture applied to oil paintings to prevent drying during the interruption of the work, and afterward washed off with water. It consists of mastic, nut oil, lead acetate and water.

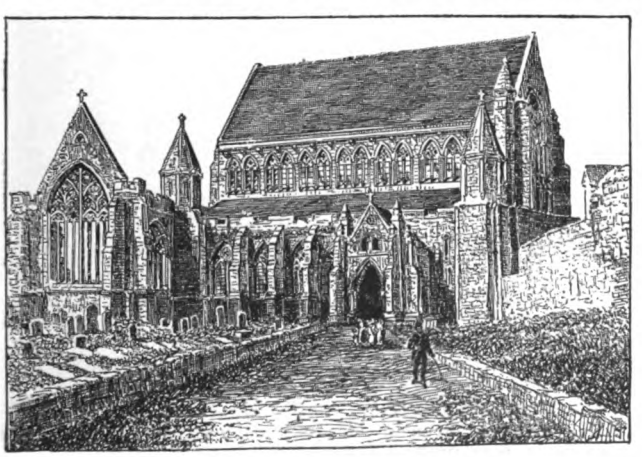
Painting. The historical decorations of the ancient Egyptians are the oldest examples of painting known. Their paints were water colors with added gum and included red, blue, yellow, green, brown, black and white. The Babylonian and Assyrian ornamentation was similar to the Egyptian; it was decorative, but entirely void of perspective. The Greek painters were skillful with the pencil, but their coloring was primitive. Their paints were ground in water, with glue or yolks of eggs added and their pictures were protected by subsequent varnishing. With the ancient Romans the art did not progress. Fresco painting with tempera or water colors on wet plaster in mural decoration was well done as the remains of Pompeii indicate. Jan Van Eyck and his brother Hubert first employed oil colors with a colorless varnish in the latter part of the 14th century. Antonello da Messina carried the art to Italy in 1465. From this time the use of oil colors extended both in the north and south of Europe, the Venetian school developing great technical skill and knowledge of coloring, though the most perfect works were produced by the Dutch painters. Water-color resembles fresco though it cannot be used for mural painting. From 700 to 1300 the art was religious and ornamental, with childish drawing and bright colors. In the next two centuries the drawing and coloring improved greatly and in the 16th century genre painting was more practiced. This was the era of the great Masters. In the 17th century genre painting reached perfection in the north of Europe. In the 18th century there was more portrait painting and pictures of cotemporary life, followed by the development of landscape painting, which in the present century has reached a high standard. Paris is now the great school of painting in the world, but the art has lost any national character and become cosmopolitan. See ENAMEL, ENCAUSTIC PAINTING, FRESCO, and ART, ORIGIN OF.

Paints. Mixtures of insoluble colors or pigments with some vehicle as oil or water, which permit it to be applied with a brush to the surface of the article to be painted. Paint is used to decorate, and to close the pores, thereby to protect the surface from air, water, and fire. See LUMINOUS PAINT.

Paired Bacteria. See COCCUS BACTERIA.

Paisiello, GIOVANNI, 1741–1816. Italian composer of numerous operas and masses.

Paisley. Town of Scotland, 7 m. w.s.w. of Glasgow. It has large manufactures of cotton, muslin, and silk, and more



The Abbey Church of Paisley.

notably of shawls. In 1163 a Clugniac priory was founded here, which was raised to an abbey 1219. The town contains many fine statues and buildings. Pop., 1891, 64,379.

Paiute Indians. See SHOSHONES.

Paix des Dames. See CAMBRAY.

Paixhans, HENRI JOSEPH, 1783–1854. French officer, inventor of the Paixhans gun 1824; this was a cast-iron cannon for firing shell; military writer.

Pakenham, SIR EDWARD MICHAEL, 1778–1815. Irish officer, distinguished in Spain; Major-gen. 1812; defeated and slain at New Orleans.

Pakfong. Alloy of copper and arsenic, made in China: formerly much used in Europe for philosophical instruments, now replaced by alloys of nickel.

Palacio, RAIMUNDO, b. ab.1840. Pres. of Venezuela 1890–92; defeated by Crespo.

Palacky, FRANCIS, 1798–1876. Historian of Bohemia, 5 vols., 1836–67.

Paladilhe, ÉMILE, b. 1844. French composer of operas (*Le Passant* 1872, *L'Amour Africain* 1874, *Suzanne* 1878, *Diana* 1885, *Patrie* 1886), symphonies, masses, etc.; most widely known by his trifle *Mandolinata*.

Palæarctic Province. Zoölogical region including n. Asia, Europe, and Africa n. of the Atlas Mts. Characteristic animals found are: Bears, Sheep, Goats, Catarrhine Monkeys, and Pheasants.

Palæaspis. Pteraspidian fish found 1883 by Claypole in the Onondaga shales of Pa. It is the only representative of this group of fishes yet known from America, and, except *Onchus pensylvanicus*, the oldest American fossil vertebrate.

Palæmon. See CARIDIDÆ.

Palaemon, QUINTUS REMMIUS, 1st cent. Latin writer on grammar.

Palæobotany. Paleontology of the vegetable kingdom; study of fossil plants. Great progress has been made during recent years in the study and elucidation of their structure and succession in time. In this field the chief laborers have been Heer, Saporta, Williamson, Sohns-Laubach, Lesquereux, Newberry, Dawson, and Ward.

Palæocarida. See GIGANTOSTRACA.

Palæocrinoids. See CRINOIDEA.

Palæologus. Last Byzantine dynasty, 1260–1453. Another branch held Montferrat 1305–1533; a third governed Morea 1380–1460. See LASCARIS.

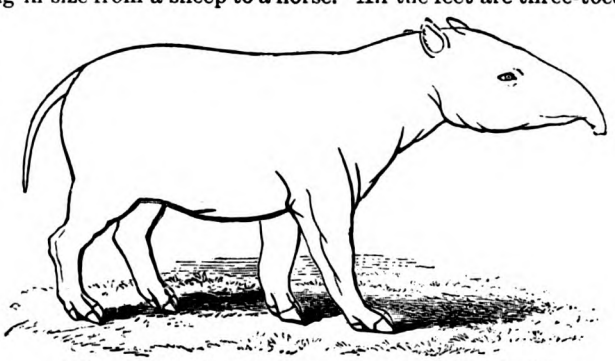
Palæonemertea. Group of nemertean worms, characterized by absence of both the deep lateral fissure on the side of the head and the stylets on the proboscis. The mouth lies behind the brain.

Palæoniscus. Heterocercal lepidoganoid fish, chiefly Carboniferous and Permian, with highly ornamented rhomboid scales and a single dorsal fin.

Palæophoneus. Scorpion recently found in the Upper Silurian rocks of Gothland, Sweden; oldest air-breather known.

Palæospondylus. Fossil found 1894 in the Lower Old Red Sandstone of Scotland. It is only ab. 2 in. long, but is considered by Traquair to be an ancient representative of the lampreys.

Palæotheridæ. Family of *Perissodactyla*, comprising fossil Ungulates from the Eocene and Miocene Tertiary, varying in size from a sheep to a horse. All the feet are three-toed.



Outline of *Palæotherium magnum* (restored), after Cuvier.

The canines are longer than the other teeth: the animals seem to have had a proboscis like the tapirs. *Palæotherium* is an example found in the Eocene.

Palæotheriodont Dentition. Upper molar teeth of the amœbodont-lophodont series, having outer tubercles of the crowns, crescentic and longitudinal, the inner tubercles united to them by oblique-transverse ridges, as in *Palæotherium*.

Palæotherium. See PALÆOTHERIDÆ.

Palæozoic. All fossiliferous strata below the top of the Permian. See COLUMN.

Palæozoölogy. Science of the distribution of animals in the strata of the earth's crust. The oldest strata (Archæan or Laurentian rocks) represent the Azoic period, when living things had not yet appeared, or if they lived, their remains have not been preserved. Next comes the Palæozoic period, characterized by fossil forms most different from species now living. This age includes the following periods: the Cambrian, Ordovician, Silurian, Devonian (Old Red Sandstone), Carboniferous or coal-age, and Permian. The great classes of animals up to and including *Ichthyopsida* had become evolved in these periods. The next age is the Mesozoic (secondary period), including the Triassic, Jurassic, and Cretaceous rocks. The *Sauropsida* became established during these periods. Finally, the Kainozoic (Tertiary) Age includes the Eocene, Miocene, Pliocene, Post-Pliocene (Post-Tertiary), including the present (Quaternary) period. During this age the *Mammalia* became established. The most SYNTHETIC TYPES (q.v.) are always found in the earlier formations. See PALEONTOLOGY.

Palæphatus. Greek compiler of legends; probably of 2d century B.C.

Palafox y Melzi, JOSÉ DE, 1780–1847. Spanish officer, famous for his defense of Saragossa, 1808–9; prisoner in France till 1813; Duke of Saragossa 1836.

Palagonite-Tuff. Fragments of palagonite intermixed with basaltic lava. It occurs in Sicily, Iceland, and Eifel, Germany.

Palaihnihan (or PALAIK) **Indians.** Indians living along Pit River in Cal. They are very degraded, due to the inroads of the Modocs and their warfare with the whites. The women are purchased in marriage and polygamy is common. When persons die of unknown diseases they are cremated, otherwise buried in a sitting posture.

Palais Royal. In Paris, built by Richelieu, who bequeathed it to Louis XIII. Louis XIV. gave it to the Duke of Orleans, in whose family it remained until 1848. The Théâtre Français is at the s.w. angle.

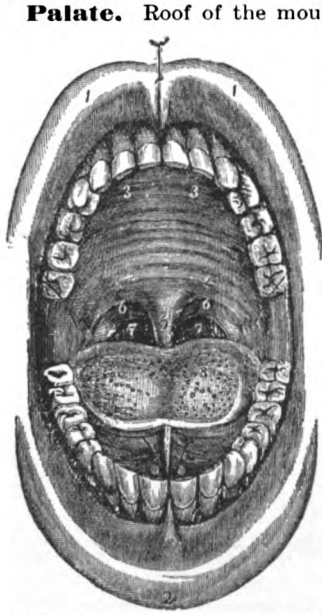
Palamedes. Greek who, when Ulysses feigned madness, detected him by placing his infant son before his plow; in later times, said to have invented lighthouses, measures, scales, and dice.

Palanquin. Asiatic vehicle for conveyance of a single passenger by four bearers.

Palaprat, JEAN, 1650–1721. French comic dramatist, collaborator of D. A. de Brueys.

Palate. In Botany, projection from the lower lip of the personate corolla of certain flowers.

Palate. Roof of the mouth, anteriorly of bone, bounded by the gums, the hard palate; posteriorly of a muscle membrane-like structure, the soft palate; terminating in the uvula, which is sometimes inaccurately called the palate.



The Mouth widely opened so as to show the Palate:

1, 1, the upper, and 2, the lower lip; 3, 3, the hard palate; 4, 4, the soft palate; 5, the uvula; 6, 6, the arches of the soft palate; 7, 7, the tonsils; 8, the tongue.

Palatinate (PFALZ). Former state of Germany, consisting of two sections, Upper and Lower. From ab.1100 till 1648 they were governed by an elector of the empire. By the treaty of Westphalia the Upper fell to Bavaria. The two were united 1777–1801, when the Lower was parceled out between several neighboring states, France getting the territory w. of the Rhine. This was restored to Germany 1814–15, Bavaria getting the greater portion.

Palatine. Officer at first attached to a sovereign's court; later, representing him in a district. In England, Cheshire was a county palatine ab.1080–1540, Durham till 1836, and Lancaster 1451–1873.

Palatine Hill. Central hill of the seven on which Rome was built; supposed site of the original city, and, in later days, of the residences of emperors and wealthy patricians.

Palato-Quadrate Bar. Cartilaginous bar in the skull of embryo vertebrates, which is replaced by the different bones that form the upper jaw, as the maxillaries and palatines. It represents, in part at least, the first visceral arch of the primitive vertebrates.

Pale. See ENGLISH PALE.

Pale, IRISH. See ENGLISH PALE.

Pale, JEWISH. In Russia, along the frontier from Baltic to Black Sea; established 1786. It lately contained over 3,500,000 Jews, who were forbidden to enter Great Russia.

Paleæ. Flat setæ of Annelids.

Paleaceous. Organs resembling palets, or bearing palets or chaff.

Paleario, AONIO, 1500–1570. Italian humanist, twice accused of heresy; burned by the Inquisition. *Immortality*, 1526; *Passion of Christ*, 1542; *Actio in Pontificco Romanos*, 1606.

Palembang. Old city of s.e. Sumatra, on the Moesi, 50 m. from Java Sea; long commercially important; now capital of a Dutch residency. Pop. ab. 50,000.

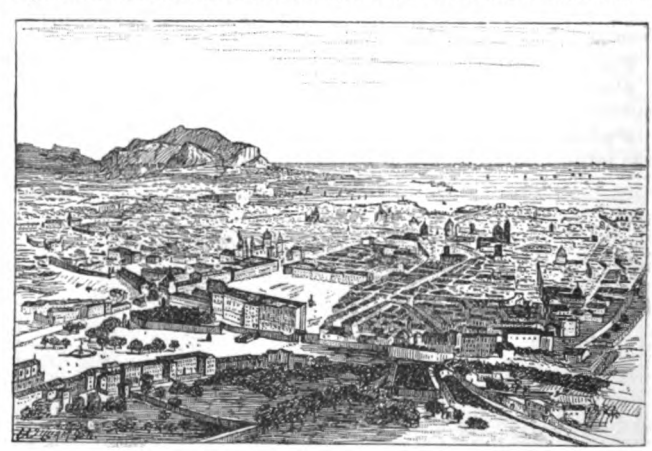
Palenque. In the state of Chiapas, Mexico. It contains the ruins of five remarkable buildings, remains of a city supposed to have been abandoned before the coming of Cortez.

Paleography. See DIPLOMATICS.

Paleolithic Man. The presence of rough stone implements in the early drift in caves and along river courses, associated with the remains of the Cave Bear, Hyena, Elephant, Mammoth, and Rhinoceros, in Europe, and similar remains in America, shows that man was widely distributed over the globe at the close of the glacial epoch, following the retreating ice northward, and perhaps living and hunting like the Eskimo, though there is doubt if the modern Eskimos are related directly to that race.

Paleontology. Science that treats of fossil remains, both animal and vegetable; now often restricted to the former. It has risen to so high a position for accuracy that it is the main dependence of the geologist in determining the age of strata. The fossil faunas of the different systems are so well known that the geologist in a new country need only collect its fossils and compare them, in order to ascertain their horizon. Much time and labor are thus saved. From Paleontology we learn that a regular gradation of organic life has existed among fossils, and that this gradation corresponds closely with that of the existing world of life, indicating a steady progress in development from the beginning. But it has not yet found any of the earliest forms. In the lowest Cambrian, from which the oldest intelligible fossils have been obtained, all the great subdivisions are present except the vertebrates. The first chapter in the evolution of the organic world is consequently yet unknown. See PALÆOZOÖLOGY.

Palermo. Seaport and largest city of Sicily, on the n. coast; anciently Panormus; held by Carthage till 254 B.C.; capital of the Saracens 830–1071, and of the Normans and their



Palermo.

successors till 1269. It has some fine old buildings, a good harbor, a large trade in fruit and wine, and a university, founded 1447, with ab. 65 instructors and 1,300 students. Pop. 1892, 273,000.

Palestine. Holy Land, the Promised Land of the Israelites; in w. Asia, between the Mediterranean and the deserts of Arabia. It measures ab.150 m. from n. to s., with an area w. of the Jordan of ab. 6.000 sq. m., and in all perhaps 11,000. The Jordan valley is greatly depressed below sea level: Lake Gennesaret is 682 ft., and the Dead Sea 1,292 ft., below the Mediterranean. The region was occupied by Canaanitish or Phenician tribes till conquered by the Hebrews ab.1400 B.C.;

from ab. 587 B.C. was held successively by Babylonians, Persians, and Greeks, and from 65 B.C. by Romans. Saracens conquered it 634. Crusaders held it 1098–1187, and portions of it till 1291. Since 1517 it has been a part of the Turkish empire. Present pop. perhaps 500,000, of whom 43,000 are Jews. A railway from Joppa to Jerusalem was opened Sept. 1892.

Palestrina. Italian town, 22 m. e. of Rome; anciently Præneste; prominent in the Latin war 340 B.C.; sacked by Sulla 82 B.C.; long held by the Colonnas; notable for its remains of antiquity. Pop. ab. 6,000.

Palestrina, GIOVANNI PIER LUIGI DA, 1524–1594. Most illustrious of church music composers in the 16th century. His most famous work is the *Missa Papæ Marcelli.*

Palets, PALEA, or PALE. In Botany, bracts which occur in a capitate inflorescence on the axis or receptacle, as in Teasel; also inner scales or glumes of the flowers of grasses; chaff.

Paley, WILLIAM, D.D., 1743–1805. Archdeacon of Carlisle 1782, prebendary of St. Paul's 1793, sub-dean of Lincoln 1795. *Moral and Political Philosophy,* 1785; *Horæ Paulenæ,* 1790. His *Evidences of Christianity,* 1794, and *Natural Theology,* 1802, were long in general use as text-books, though their viewpoint was utilitarian. The latter applied the argument from design in Nature, and its adaptations, to prove the existence of God. —His grandson, FREDERICK APTHORP, LL.D., 1816–1888, entered the R. C. Ch. 1846, and edited sundry Greek classics.

Palfrey, JOHN GORHAM, D.D., LL.D., 1796–1881. Prof. Harvard 1831–39; ed. *N. American Review,* 1835–43; M.C. 1847–49. *Evidences,* 1843; *Jewish Scriptures and Antiquities,* 4 vols., 1833–52; *Hist. New England,* 4 vols., 1858–64.—His daughter, SARA HAMMOND ("E. FOXTON"), b. 1823, pub. *Herman,* 1866, and several volumes of verse, especially *Sir Pavon and St. Pavon,* 1867.

Palgrave, SIR FRANCIS, 1788–1861. English historian, of Jewish parentage (orig. COHEN), knighted 1832; keeper of records from 1838. *English Commonwealth,* 1832; *Corporations,* 1832; *King's Council,* 1834; *History of Normandy and of England,* 4 vols., 1851–64.—His son, FRANCIS TURNER, b. 1824, Prof. of Poetry at Oxford 1886, editor of the *Golden Treasury of English Lyrics,* 1861, has written *Essays on Art,* 1866, and several vols. of poetry.—His brother, WILLIAM GIFFORD, 1826–1888, was an officer in India 1847–53, a Jesuit priest till 1864, a consul in Asia and elsewhere, and Minister to Uruguay from 1884. His dangerous journey through Arabia was described in a *Narrative,* 1865. *Hermann Agha,* 1872; *Dutch Guiana,* 1876; *Ulysses,* 1887.

Pali. Calcareous and vertical rods encircling the columella in some corals. They are not united to the septa.

Palikao. In China, below Peking; scene of an Anglo-French victory 1860. For it the commander, Gen. Cousin-Montauban, 1796–1878, was made Count P. and Senator. He became Premier of France and Minister of War shortly before Napoleon III.'s fall.

Pali Language. Dialect derived from the older Sanskrit, becoming in time the sacred language of the Buddhists, and still used by Buddhist writers in Burmah, Siam and Ceylon.

Pali Literature. That of the Buddhist sacred texts, and all other works by Buddhist authors. It is still used in Ceylon, Burmah, and Siam. See PALI LANGUAGE.

Palimpsest. Vellum or other material from which the writing had been erased, that it might be written on anew. Sometimes the erasure has been so imperfect that the original writing can be deciphered or restored, as in an old painting: this has led to the recovery of many mediæval texts, especially MSS. of 600–900.

Palindrome. Sentence spelled the same, forward or back, as "Madam, I'm Adam"; common in Latin, unfamiliar in Greek and in modern languages.

Palingenesis. PARALLEL VARIATION (q.v.) without CENOGENY (q.v.).

Palinode. Song or poem repeated; thence, denying or retracting a previous one.

Palinurus. Æneas' helmsman, who fell into the Tyrrhenian Sea; thence a promontory of Lucania, s. Italy.

Palisa, JOHANN, b. 1848. Astronomer at Vienna, discoverer of 66 asteroids, Aug. 1889.

Palisade-Cells. Layer or layers of cells, placed, with their longer diameters vertical, immediately under the upper epidermis of leaves. They contain much chlorophyll, and so cause the upper surface of most leaves to be greener than the lower.

Palisades. Cliffs on w. bank of Hudson, in N. J., extending 20 m.; ht. ab. 300 ft. They are outcrops of trap-rock.

Palisot de Beauvois, AMBROISE MARIE FRANÇOIS JOSEPH, BARON, 1752–1820. French botanist. *Flore d'Oware et de Benin en Afrique,* 1804–7; *Fructification des Mousses et des Lycopodes,* 1811; *Essai d'une nouvelle agrostographie,* 1812.

Palissot de Montenoy, CHARLES, 1730–1814. French playwright and satirist. *Les Philosophes,* 1760; *Œuvres,* 6 vols., 1809.

Palissy, BERNARD, ab. 1510–1589. French potter of genius, inventor of a process of enameling; twice imprisoned as a Protestant. He died in the Bastile. His best-known pieces

Rustic Plate, by Palissy.

are those decorated with snakes and lizards in relief, colored to closely resemble nature, and were probably molded from the animals themselves.

Palladic Chloride. $PdCl_4$. Made by dissolving the metal in aqua regia, similar to platinic chloride; unstable, decomposing into palladous chloride, $PdCl_2$, and chlorine.

Palladio, ANDREA, 1518–1580. Italian architect, chiefly at Vicenza and Venice. His book, *Dell' Architettura,* 1570, had wide circulation and great influence.

Palladium. Pd. At. wt. 106.6, sp. gr. 11.8, sp. ht. .058, mpt. 1,500° C., valence III., IV., VI. Rare metal, discovered by Wollaston 1803. Its chief source is a Brazilian gold-ore, from which it is obtained by melting it together with silver, then treating with nitric acid, which dissolves the silver and palladium; the latter is precipitated as the cyanide, which upon ignition yields palladium. It resembles iridium and platinum in appearance. The most characteristic property is its power to absorb hydrogen (see PALLADIUM HYDROGEN). It is soluble in nitric and hot concentrated sulphuric acids, is not affected by air and is used for graduated scales and, alloyed with silver, for tooth-fillings.

Palladium. Image of Pallas Athene, supposed to have fallen from heaven, on which the safety of Troy depended; stolen by Ulysses and Diomed; said to have been preserved in the Acropolis at Athens. The Romans claimed that it was taken to Italy by Æneas and kept in the temple of Vesta.

Palladium Bromides. $PdBr_2$. Brown substance, soluble in aqueous hydrobromic acid; made by dissolving palladium in a mixture of bromine hydrate and nitric acid. A tetrabromide occurs in double salts, but has not been isolated.

Palladium Cyanides. $Pd(CN)_2$. Palladous cyanide. Yellowish-white, slimy substance, soluble in ammonium hydroxide; made by precipitating a palladous salt with potassium cyanide.—$Pd(CN)_4$. Palladic cyanide. Present in the blood-red solution obtained by shaking finely divided potassium palladium chloride with a solution of mercuric cyanide.

Palladium Hydrogen. If metallic palladium be placed in an atmosphere of hydrogen, it absorbs 960 times its volume of the gas. This substance acts as an alloy, and is an excellent reducing agent.

Palladium Hydroxide. $Pd(OH)_2$. Dark-brown precipitate, obtained by adding sodium carbonate to a palladium salt, and heating.

Palladium Iodide. PdI_2. Horn-like substance, soluble in ammonium hydroxide and potassium iodide; made by precipitating a palladous salt with potassium iodide.

Palladium Nitrate. $Pd(NO_3)_2$. Long brownish-yellow rhombic prisms, obtained from a solution of the oxide in nitric acid.

Palladium Oxides. Pd_2O. Suboxide. Black powder, obtained by igniting palladium carbonate.—PdO. Palladous oxide. Gray to black powder of metallic luster, soluble with difficulty in acids; made by gently heating palladium nitrate. —Pd_5O_6. Hexoxide. Bright-brown powder, obtained by heat-

ing palladium sulphosalts with potassium nitrate and hydroxide.—PdO_2. Dioxide. Black powder, obtained by precipitating the chloride with hot caustic potash.

Palladium Sulphides. Pd_2S. Subsulphide. Whitish-gray substance, not attacked by acids; obtained by heating the higher sulphides.—PdS. Palladous sulphide. Bluish-black powder, obtained by heating the metal with sulphur, or by precipitating a palladic salt with hydrogen sulphide.—PdS_2. Disulphide. Crystalline powder, made by decomposing sodium sulphopalladate with hydrochloric acid.

Palladius, ab.368–431. Bp. in Bithynia and Galatia. His *Hist. Lausiaca* (Lives of Monks) was pub. 1616.

Palladius, 7th cent. Greek medical writer.

Palladius, St. Traditional Irish or Scottish bishop ab. 430.

Palladius, Rutilius Taurus Æmilianus, 4th cent. Latin writer, whose *De Re Rustica* was tr. 1803. Book 14 is in verse.

Pallas. See Athena and Minerva.

Pallas. Second asteroid, discovered 1802 by Olbers.

Pallas, Peter Simon, 1741–1811. German naturalist, who traveled in Asia 1768–74 under Russian auspices. *Reise*, 1771–76; *Flora Rossica*, 1784–88; *Southern Provinces*, tr. 1812. He lived in the Crimea from 1796.

Pallasite. Meteorite consisting largely of iron, but also containing interspersed grains of chrysolite or some similar mineral.

Pallavicino, Ferrante, 1618–1644. Italian satiric poet, executed at Avignon.

Pallavicino, Sforza, 1607–1667. Italian Jesuit, prof. at Rome 1639, Cardinal 1659. Of his many works the most noted is a *Hist. Council of Trent*, 1656–57, offered as a substitute for the too liberal one of Sarpi.

Pallial Line. Line on interior of clam's shell, along which the mantle is attached by means of muscle fibers.

Palliata. See Tectibranchia.

Pallice. French harbor outside Rochelle, opened 1889.

Palliobranchiata. See Brachiopoda.

Palliser, Sir William, 1830–1882. Irish officer, inventor of projectiles and of methods of improving guns; M.P. 1872; knighted 1873.—His brother, John, b. 1817, explored wild parts of n.w. Canada 1857–60. *Solitary Hunter*, 1853; *Report*, 1861.

Pallium. Mantle of Mollusks.

Pallium. Woolen stole, adorned with black crosses, worn by the pope, and sent to a new archbishop, as necessary to his complete investiture and institution.

Pall Mall. Street in London, near St. James's Park; named from a game formerly much played there, which consists in driving a ball through an elevated hoop with a mallet of peculiar shape.

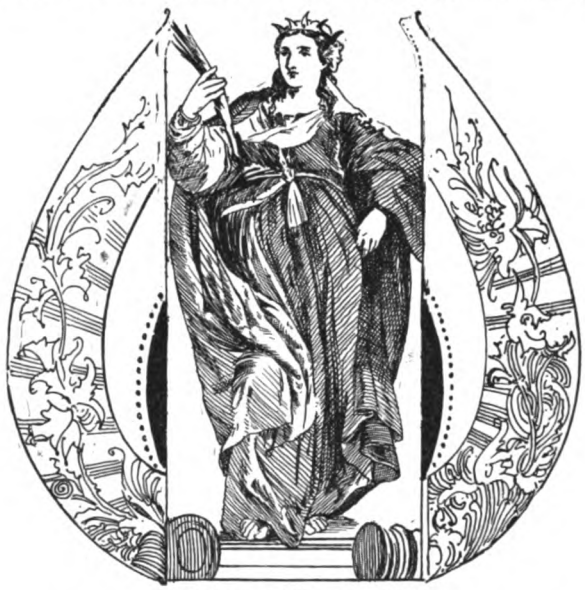
The Game of Pall Mall.

Palm, Johann Philipp, 1768–1806. Bookseller of Nuremberg, shot by Napoleon's order for circulating a pamphlet reflecting on the French invasion. His execution was both a crime and a blunder, and did much to stir up a national spirit in Germany.

Palma. Capital of the Balearic Isles; on s. coast of Majorca. It has fine old buildings, some manufactures, and a fair trade. Pop. ab. 61,000.

Palma. One of the Canary Islands. Area 330 sq. m., pop. ab. 40,000.

Palma, Giacomo ("Vecchio"), ab.1480–1528. One of the greatest Venetian painters. The *Daughters of Palma* in Dresden and the *Saint Barbara* in Venice are his best known works.—His great-nephew, Giovane, 1544–1628, was an inferior painter.



St. Barbara, by Giacomo Palma.

Palma, Ricardo, b. 1833. Peruvian author.

Palmaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising ab.129 genera and 1,100 species, mostly trees and shrubs, widely distributed throughout tropical and warm regions; called the Palm family.

Palma Christi. See Castor-Oil Bean.

Palmate, or Digitate. Arrangement of principal veins of a simple leaf or leaflets of a compound leaf in a radiating manner from a point, as in the Geranium and Horse Chestnut.

Palmati. Swimming legs of birds, having a posterior toe and three anterior ones, the latter united to their tips by a web.

Palmatiped. Palmately cleft leaves or other organs.

Palmblad, Wilhelm Fredrik, 1788–1852. Swedish novelist, geographer, historian, and compiler; prof. Upsala 1835. *Dict. of Biography*, 23 vols., 1835–59.

Palmellin. Red pigment contained in certain minute organisms of *Palmellaceæ*.

Palmer. Pilgrim in crusading times, returned with palms from the Holy Land; later, any pilgrim.

Palmer, Benjamin Morgan, D.D., LL.D., b. 1818. Pastor at New Orleans from 1856; ed. *Southern Presb. Review* from 1847. *The Family*, 1876.

Palmer, Edward Henry, 1840–1882. Explorer in Palestine 1868–70; prof. Cambridge 1871–81; killed by Arabs in the Sinaitic peninsula. *Desert of the Exodus*, 1871; *Arabic Grammar*, 1874; *Persian Dictionary*, 1876–83; tr. *Koran*, 1880.

Palmer, Erastus Dow, b. 1817. American sculptor, distinguished for reliefs of ideal and allegorical subjects. His bronze statue of Robert R. Livingston is in the old Hall of Representatives in Washington.

Palmer, James Shedden, U.S.N., 1810–1867. Captain 1862, Commodore 1863, Rear-admiral 1866; distinguished at Vicksburg, New Orleans, and Mobile.

Palmer, John McCauley, b. 1817. Brig.-gen. U. S. Vols. 1861; Major-gen. 1862–66, serving chiefly in Tenn. and Ga.; Gov. of Ill. 1869–73; U. S. Senator 1891–97; National Democratic candidate for Pres. 1896.

Palmer, John Williamson, b. 1825. American author, as is his wife, Henrietta (Lee), b. 1834.

Palmer, RAY, D.D., 1808–1887. Pastor at Albany, N. Y., 1850–66; sec. Cong. Union 1866–78; author of *My Faith Looks up to Thee*, 1830, and many other favorite hymns.

Palmer, ROUNDELL. See SELBORNE, LORD.

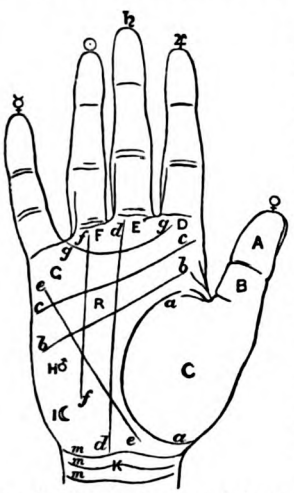
Palmerston, HENRY JOHN TEMPLE, VISCOUNT, 1784–1865. M.P. 1806; Sec. of War 1809–28; Foreign Sec. 1830–41 and 1846–51; Home Sec. 1852–55; Premier 1855–58 and from 1859; Tory till 1828, then Whig. He was a plain but effective speaker, and one of the most popular of British ministers.

Palmetto. Several species of palms, natives of Florida and West Indies.

Palmetto Leaves. Leaves of the Palmyra palm, found in India. They are used in the manufacture of hats and mats.

Palmieri, LUIGI, 1807–1896. Prof. Naples 1847; director Vesuvius Observatory 1854; writer on meteorology.

Palmistry, or CHIROMANCY. Art of divination by examining lines in the palm of the hand; said to have come from India. It is to be distinguished from chirognomy, which deals with the supposed indications of the general shape of the hands. The principal lines of the palm are designated respectively as those of Life, the Head, the Heart, Saturn or Fate, the Liver, and Sun or Fortune. The prominences or depressions at the base of each finger also are regarded as highly significant, and are called by the names of the planets: Jupiter, Saturn, Mars, Mercury, Venus, Apollo (the Sun), and the Moon. These are referred to the tastes or passions. The lines are interpreted according to their depth, color, and length, and their relations to the prominences or Mounts. The lines of the wrist, called Rascettes, or bracelets, are believed to indicate the duration of life, each line representing thirty years. A belief in palmistry exists in China and Japan, and is known in Japan as Te-no-suji-mi, or Hand's Line Looking. Great significance is there attached to the fine lines at the inner joints and on the palmar surfaces of the fingers. Those across the inside of the first finger indicate skill and thrift; at the first joint of the thumb wealth, and on the palm below the thumb wisdom. Lines on the palm below the little finger indicate children, as many as there are lines; the lines below these refer to success in matrimony. If the fine lines on the palmar surface of the middle finger are in the form of a circular spiral, it is a sign of skill in handwriting. These indications refer to the left hand; another series is supposed to apply to the right. The Line of Life receives the same name as in Europe, and is also known as the Line of Earth or Mother, while that of the Heart is thought to represent Heaven or Father, and that of Head, Man, or the individual himself. The relations of these lines, forming the cosmical Trinity, are believed to be of the highest importance. See CHIROMANCY.



A, will; B, logic; C, mount of Venus; D, mount of Jupiter; E, mount of Saturn; F, mount of Apollo; G, mount of Mercury; H, mount of Mars; I, mount of the Moon; K, the rascette; *a, a*, line of life; *b, b*, line of head; *c, c*, line of heart; *d, d*, line of Saturn or fate; *e, e*, line of liver or health; *f, f*, line of Apollo or fortune; *g, g*, the girdle of Venus; R, the quadrangle; *m, m, m*, bracelets of life.

Palmitic Acid. $C_{16}H_{32}O_2$. Mpt. 62° C. White, solid, crystalline acid, prepared by the decomposition of palmitin by water. Its sodium salt is one of the main constituents of soap, and is prepared by the action of caustic soda upon palmitin. It is also prepared from its soap. It occurs in palm oil, animal fats, olive oil, and Japanese beeswax.

Palmitin. $C_3H_5(O.C_{16}H_{31}O)_3$. Tri-palmitin. Mpt. 66° C. Combination of the glyceryl group with palmitic acid; white plates; chief constituent of palm oil, and present in most animal and vegetable fats. Caustic alkalies decompose it, forming glycerin and palmitic acid salts or soaps.

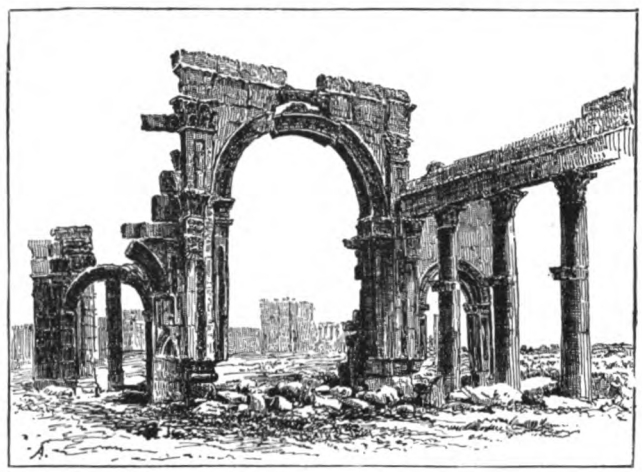
Palm Oil. Semi-solid yellow fat, prepared by boiling the fruit of certain palms with water. It consists mainly of tripalmitin, but also contains palmitic and sebacic acids. It is used in soap-making. It is exported from Africa.

Palms. Aborescent endogens, chiefly inhabiting the tropics, distinguished by their fleshy, colorless, six-parted flowers inclosed within spathes and rigid, pinnated, articulated leaves. They produce wine, oil, sugar, salt, thread, utensils, weapons, sago, etc. The most common species is the cocoanut. The stems furnish a great variety of wood which is used for cabinet and marquetry work and for billiard cues. See PALMACEÆ.

Palm Sunday. Sunday before Easter, so called from the R. C. Ch. ordering palm branches to be carried in procession in imitation of those strewn before Christ when he entered Jerusalem. It is customary to consecrate palm branches, which are afterward distributed to the congregation, in R. C. churches on this day.

Palm Wine. Alcoholic beverage used in India, Africa, and Chili; prepared from the sap of the palm tree.

Palmyra, or TADMOR. City of e. Syria, in an oasis; said to have been built by Solomon. It attained its greatest splendor under Hadrian, who renamed it Adrianopolis, ab.130. Here Zenobia ruled 266–272, when Aurelian took the city and destroyed it. The ruins became known to Europeans 1678.



Triumphal Arch at Palmyra.

Palo Alto. Battlefield in s. Texas, where 2,300 Americans under Gen. Taylor defeated 6,000 Mexicans, May 8, 1846.

Palo Alto. In Cal., 30 m. e. of San Francisco; seat of Leland Stanford, Jr., University.

Palos. Seaport of s.w. Spain, whence Columbus sailed 1492. Pop. ab.1,200.

Palpicornia, or HYDROPHILIDÆ. Swimming beetles with pentamerous tarsus and a pair of short, club-shaped antennæ; the maxillary palps are often longer than the antennæ. They feed on plants.

Palpitation of the Heart. A consciously rapidly beating heart. It may indicate disease of that organ, but is often caused by a disordered stomach.

Palpocil. Delicate hair-like process of a cell used for purposes of touch.

Palps, or FEELERS. 1. Distal joints of the endopodite in the mandibles and maxillæ of arthropods. 2. Certain tentacles on the heads of annelids.

Palsy. Loss of sensation or motion of any of the muscles of the body (see PARALYSIS). That form of paralysis accompanied by involuntary movements or shakings is frequently meant when this word is employed.

Paltock, ROBERT, ab.1699–1767. English author of *Peter Wilkins*, 1750, a curious romance of flying islanders, anonymous till 1835.

Paludan-Müller, FREDERIK, 1809–1876. Danish poet, dramatist, and novelist. *Adam Homo*, 3 vols., 1841–49; *Kalanus*, 1854; *Ivar Lykke*, 3 vols., 1866–73; *Adonis*, 1874.—His brother, CASPAR PETER, 1805–1882, prof. Copenhagen 1872, was a historical writer.

Paludicolæ (ALECTORIDES). Group of *Grallæ*, including the *Macrodactyli* or *Rallidæ* (Rails) and the *Pressirostres* or *Gruidæ* (Cranes).

Paluli. Pillars in corals, surrounding the columella; independent of the septa.

Palustrine. Plants and animals growing naturally in marshes.

Pambour's Theorem. "In a heat engine, moving with a uniform periodical motion, the mean effective pressure of the fluid is equal to the total resistance per unit of area of piston."

Where the resistance is known, the mean velocity of the piston of such an engine will be found from the formula: $Ns = \frac{r^1hW}{rpA}$. In this, N = strokes using steam per min.; s = stroke length; r^1 = apparent ratio of expansion, and r = the real ratio when clearances in the cylinder are allowed for; h = the available heat of combustion in foot-lbs. for one lb. of coal; W = the lbs. of coal burned per minute; A = area of piston in square inches, and p = pressure equivalent to the expenditure of heat. r and p have to be calculated from other formulæ; the others are matters of observation. The principle was first applied by Count de Pambour in his *Theory of the Steam Engine* and *On Locomotives.*

Pamir. Plateau in w. Asia, ab.13,000 ft. above sea. On the south is the range of the Hindu Kush, and from it radiate the Karakorum and the Thian Shan. It is a desert region, sparsely populated, and controlled by Russia. The mountain ranges rise 4,000 to 5,000 ft. higher, and some reach an altitude

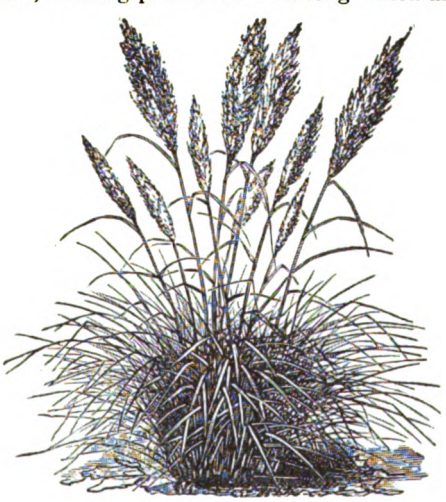
View in the Little Pamir.

of 25,000 ft. The valleys vary in length from 10 to 80 m., and from 1 to 6 m. in width. G. N. Curzon (1894) holds them to be of glacial origin. This region covers ab. 37,000 sq. m., and is sometimes called the Roof of the World.

Pamlico Sound. On coast of N. C.; ab. 75 m. long and 20 ft. deep.

Pampas. Plains of S. America, especially Argentina. See LLANOS.

Pampas Grass. *Gynerium argenteum.* Large grass of s. S. America, forming plumes ab. 2 ft. long which are used in



Pampas Grass (*G. argenteum*).

decorating; much planted for ornament. The leaves are from 6 to 8 ft. long and the stem from 10 to 14 ft. The cultivation and preparation of the plant form a considerable industry.

Pampas Indians. Nomadic shepherds of s.w. Brazil, Paraguay, etc., formerly hunters. They are warlike, proud, and independent, despising agriculture and navigation. Some of the tribes practice polygamy. The s. Pamperos are dark-skinned, strong, and skilled in throwing the bolas. They secure their wives by purchase. Infanticide is greatly practiced.

Pampero. Dry cool w. or s.w. wind, blowing over the plains of Argentina and of Brazil. The approaching change from e. winds to the Pampero is announced by long arches of rolling cloud, followed by squalls of wind and rain. See LINE SQUALLS.

Pamphilus, ab. 240–309. Presbyter at Cæsarea; founder of a library there; author, with Eusebius, of an apology for Origen, whose writings he did much to disseminate. He was martyred.

Pamphlets. Tracts or small books, usually unbound; long important in political and theological controversies.

Pamphylia. Coast region of s. Asia Minor, with Mt. Taurus on the n.e.; anciently occupied by Greeks and barbarians, with a mixed language.

Pamplona, or PAMPELUNA. Town of n. Spain, on the Arga; founded 68 B.C. by Pompey; capital of Navarre 907; held by French 1808–13. Pop. ab. 27,000.

Pamprodactylous. Bird having all the four toes turned forward, as in true Swifts. Their relatives, the Swiftlets, makers of the edible birds' nests, have the first toe directed backward, and are hence anisodactylous.

Pamunkey River. Virginia river full of sand bars, formed by the junction of the N. and S. Anne River flowing s.e., and with the Mattapony forms York River. Length 75 m.

Pan. Greek (especially Arcadian) god of forests and meadows; represented as man above, goat below; inventor of shep-

Pan with the Tibia Vasca.

herd's flute; thought to suggest panic terrors, such as are felt in lonely places; afterward identified with The All, as in the words, "Great Pan is dead," an omen of the fall of Paganism.

Pan. 1. Shallow sheet-iron dish, used in prospecting for gold. The sand or gravel is stirred with water, the worthless matter is removed from the top, and the gold is found at the bottom. 2. Piece of gold-mining machinery, in which the rock is ground with mullers and the gold collected by amalgamation at the same time.

Panacea. Remedy vaunted to be able to cure a number of diseases; a cure all.

Panæsthetism. Doctrine that consciousness is or may be connected with other forms of matter besides protoplasm.

Panætius, 185–112 B.C. Roman stoic philosopher, author of a treatise on virtue, which influenced Cicero in the production of the *De officiis.*

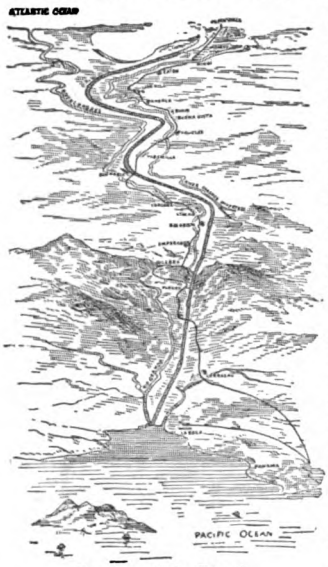
Panagia. In Eastern Ch., Virgin Mary; also Eucharistic bread.

Panama. City and seaport of Colombia, on s. coast of the Isthmus of P., at s. terminus of the P. R.R. and of the projected ship canal. Pop. ab. 25,000.

Panama, BAY OF. Small arm of the Pacific, washing s. shore of Isthmus of P.

Panama, ISTHMUS OF. Narrowest part of the American Continent, connecting link between N. and S. America, 32 m. wide, with a minimum elevation of 290 ft.; crossed by a railway, 47½ m. long, opened 1855.

Panama Canal. Ship canal, 46 miles long, proposed across the Isthmus of P. and partially constructed 1880–88 at an expenditure of $178,000,000; abandoned owing to financial difficulties and improper management. It was originally designed to be a sea level canal, but later plans contemplated 4 locks of large size. The U. S. Government had made careful surveys at the isthmus 1872–75. A concession for constructing a canal was obtained by a Frenchman, Lieut. Wyse, 1877. A company was organized, the concession purchased, and the work of excavation begun 1881. The company failed 1889, after making a navigable channel for ab. one-fourth of the whole distance, and that the easier portion. See LESSEPS, FERDINAND DE.



Panama Ship Canal.

Pan-American Congress. Proposed by J. G. Blaine; held at Washington Nov. 18, 1889–April 19, 1890, by representatives of various American countries, who discussed matters of international interest, and recommended reciprocity treaties and uniformity of coinage, weights, and measures. The gathering had no important results.

Pan-Anglican Synods. Conferences held at Lambeth Sept. 1867, July 1878, and June 1888; attended by English, Colonial, and American bishops, the Abp. of Canterbury presiding.

Panard, CHARLES FRANÇOIS, 1694–1765. French author of many songs and vaudevilles, partly pub. 1764 and 1803.

Panas, PHOTINOS, b. 1832. Greek surgeon in Paris, writer on diseases of the eye.

Panathenæa. Quadrennial Attic festival in honor of Athena, the patron deity of Athens. Games were celebrated, and the sacred peplus or robe was carried in procession. This is represented in the frieze of the Parthenon.

Panchatantra. Oldest collection of Sanskrit stories; extant in varying texts, whence translations have been made since 550 into sundry Oriental and European languages.

Pancoast, JOSEPH, M.D., 1805–1882. Prof. Jefferson Medical Coll., Phila., 1838–74. *Anatomy*, 1844; *Operative Surgery*, 1844–52.—His cousin, SETH, M.D., b. 1823, besides medical books, pub. *Cabala*, 1877.

Pancras, ST., 290–304. Phrygian boy, martyred at Rome; regarded as the avenger of false oaths.

Pancreas. Gland found in abdomen, connected with small intestines, secreting pancreatic fluid, which is complex in its composition and supplies the digestive ferment for intestinal digestion. It acts upon albumen, starch, and fat. The pancreas of ruminating animals is used as food, called sweetbread.

Pancreatin. Active elements of the pancreatic juice and more especially that separated from the pancreas of animals to be used to assist weak digestion or to peptonize food before it is eaten.

Panda (WAH). *Ailurus fulgens;* one of the *Procyonidæ*,

Panda (*Ailurus fulgens*).

inhabiting the mountain heights of the Himalayas; called by Cuvier "the most beautiful of quadrupeds." They resemble a cat, but have larger ears and bushier tail. The fur is thick and soft, deep black beneath, faun color behind, and cinnamon-red above, with white on the head; the tail is ringed alternately with red and yellow. It is plantigrade: the soles of the feet are covered with wool. It is bear-like in its feeding and habits.

Pandanaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 2 genera and ab. 80 species, mostly trees and shrubs, growing in the tropics of Asia, Africa, Oceanica, the Indian Archipelago, and Australia.

Pandean Pipe, or PAN PIPES. Survival of the Greek syrinx, and possibly of the Hebrew organ; series of tubes of various lengths, closed at the bottom and open at the top, lashed together side by side. The sounds are produced by blowing across the open ends.

Pandects. Digest of the writings of Roman jurisconsults, made by Justinian's direction; issued Dec. 533. From that time the citation of any passage in the juristic writings, not found in the Pandects, was forbidden. They contain over 9,000 excerpts from 39 authors, classified under 429 titles and grouped in 50 books.

Pander, CHRISTIAN, 1794–1866. Russian geologist, founder of our knowledge of the Silurian formations of Russia; best known in connection with the discovery of the *Conodonts*. *Geognosy*.

Pandiones. Section of Raptatorial Birds, including the OSPREY (q.v.) or Fishing Eagle.

Pandit. See PUNDIT.

Pandora. In Greek Mythology, first woman, made of earth by Hephæstos, and gifted by each of the gods with some power by which to work the ruin of man. She opened a box containing all human ills, but shut it in time to prevent Hope from escaping also.

Pandorineæ. Family of minute, green, multicellular, free-swimming, fresh-water *Algæ* of the order *Volvocaceæ*, increasing by both propagative and reproductive processes.

Pandours. In 18th century, Austrian infantry of Servian descent, lawless and fierce; levied in Hungary.

Pandulf, d. 1226. Roman legate to England to negotiate with King John, whose homage as vassal of the Pope he received 1213; Bp. of Norwich 1218.

Panel. In Coal Mining, large rectangular block of coal, laid out for working independently of the rest of the mine.

Panel. Primarily, a piece of wood recessed and surrounded by projecting pieces in a door, wainscot ceiling, or piece of furniture, but applied also to all recessed parts similarly framed, whether in woodwork or masonry.

Panel. Space between two vertical posts of a truss; distance between two joints of a chord of a truss. Its length is usually slightly less than the depth of the truss. The floor beams which support the roadway are attached to the chords at the panel points.

Pange Lingua Gloriosi. First line of two famous Latin hymns, one on the Passion, by Venantius Fortunatus, 530–609; the other, Eucharistic, by Aquinas, 1225–1274.

Pangenesis. Theory of Darwin that the generative cells are collectors of spores (gemmules) thrown off from all the cells of the body throughout life. During development the gemmules produce their corresponding tissues again. Prof. W. K. Brooks has suggested certain modifications: 1. The generative cells are direct descendants from the egg which produced the body of the parent, and therefore the gemmules of each egg can develop a child resembling the parent. 2. New gemmules are received especially from tissues that are subjected to strain through ill adaptation to environment. 3. These gemmules hybridize the old gemmules of like kind, and so the resulting tissue receives an impulse to vary. 4. The male gametes are specially differentiated to receive new gemmules; hence the male leads in progress. Thus variations are produced when and where they are needed, and the very long period required for evolution, according to Darwin's theory, may be greatly shortened. See NATURAL SELECTION and LAMARCKIANISM.

Pangolin (MANIS). Scaly Anteaters; several species of Edentates of Africa and s.e. Asia. The hind feet are plantigrade; of the fore feet, the animal walks on its knuckles. On the back and tail the hairs of these mammals have become modified into broad overlapping scales, the whole resembling

a pine cone. When alarmed they roll into a ball, like the hedge-hog. They burrow rapidly, and lie concealed by day.

White-bellied Pangolin (*Manis tricuspis*).

Their stomach is gizzard-like; even stones are swallowed to aid digestion.

Panicale, MASOLINO DA. 1378–1415. Italian painter, chiefly at Florence.

Panicle. Compound flower-cluster, with loose and numerous branches, as in many grasses and *Liliaceæ*.

Panics. Severe commercial crises. Such have occurred in the U. S. 1837, 1857, 1873, 1893; in England 1793, 1814, 1825–26, 1847, 1866; in Australia 1892.

Panini. Sanskrit grammarian, probably of 4th cent. B.C. His work was pub. at Leipzig 1886.

Panipat. Town in the Punjab, n. India; scene of 3 decisive battles: defeat of the imperial forces of Delhi by Bábar on his invasion of India 1526; overthrow of an Afghan army 1556 by Akbar, grandson of Bábar; and defeat of the Mahrattas by Ahmed Sháh Durání, Jan. 7, 1761. Pop. ab. 25,000.

Panizzi, SIR ANTHONY, 1797–1879. Italian refugee, in British Museum 1831–61; chief librarian 1856; knighted 1869; ed. Ariosto 1834.

Panjab. See PUNJAB.

Pannini, GIOVANNI PAOLO, ab.1695–1768. Italian painter, eminent for views of Roman ruins and historic architecture. Picturesque effect rather than literal accuracy was his aim.

Pannonia. Roman province ab. 8–430, s. and w. of the Danube, n. of Illyricum; now mainly in Hungary.

Pannose. Surfaces of leaves and other organs when covered with felt-like, matted hairs.

Panopolis. Ancient Egyptian city on the Nile. Its metropolis was unearthed 1884.

Panorama. Kind of extended painting invented 1788 by R. Barker of Edinburgh, and long exhibited on movable cylinders. The diorama and cyclorama are varieties.

Panormitanus. See TUDESCHIS.

Panormus. See PALERMO.

Pan-Presbyterian Councils. Held at Edinburgh July 1877, Philadelphia 1880, Belfast 1884, London 1888, Toronto 1892.

Panslavism. Movement looking to the union in one confederacy of all the Slavic races. Panslavic congresses met at Prague 1848 and Moscow 1867.

Panspermy. Theory that all living forms have been produced only from pre-existent living forms.

Pansy. Large-flowered forms of *Viola tricolor*, plant of the Violet family, native of Europe, widely cultivated as a garden flower. Garden pansies are not preserved or propagated

Pansy (*Viola tricolor* and *V. odorata*).

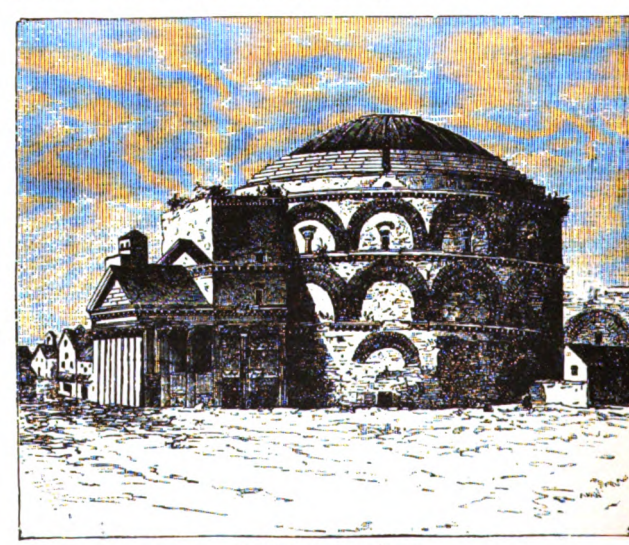
without great difficulty, as they easily relapse to their wild form.

Pantænus. Head of the Catechetical School at Alexandria 180–203, preceding Clement. Only fragments of his writings remain.

Panthays. Mohammedan community occupying the s.w. of China, who asserted their independence in 1855. They are the descendants of Arab immigrants who settled here soon after the Hegira, and of Mongol soldiers led here ab.1250. The Chinese government recognized them 1866, but suppressed their empire 1872.

Pantheism. Theory which reduces all the phenomena of the universe, whether mental or physical, to modes or activities of the absolute, emanations from the substance of God; assumed to be incompatible with the immortality of the soul. Identification of God with the universe. It existed anciently in Indian and Greek philosophy, and was revived by Bruno (d. 1600) and Spinoza.

Pantheon. Only perfectly preserved building of ancient Rome. It is dome-shaped and fronted by a Corinthian portico, supporting a pediment. The interior dome is 142 ft. high, with the same diameter, and is lighted by an orifice at the center.



Pantheon of Agrippa.

It is supposed to have been designed as part of the Baths of Agrippa, who began its erection 27 B.C.; after completion it was transformed into a temple for the gods of the conquered nations. It became a Christian church 610 as Santa Maria Rotonda. It is the burial-place of Raphael.

Panthéon. Of Paris; Church of Ste. Geneviève, built in form of a Greek cross, 276 by 370 ft., with a central dome 272 ft. high. It stands on the site of a church built by Clovis, was

begun 1764, and dedicated by the Convention to the illustrious men of France, but since restored to Christian worship.

Panther. See LEOPARD and PUMA.

Pantodonta. See AMBLYPODA.

Pantograph. Instrument for copying a drawing, and at the same time enlarging or reducing its size.

Pantoja de la Cruz, JUAN, 16th cent. Spanish portrait-painter.

Pantomime. Dramatic representation conducted without spoken words. It began at Rome under Augustus, was popular and often objectionable during the Middle Ages, the players wearing masks: these being removed, facial contortions were added to movement and gesture. In England it still has great attractions for children at Christmastide.

Pantopoda. See PODOSOMATA.

Panyasis OF HALICARNASSUS, d. ab.457 B.C. Greek epic poet; uncle of Herodotus; put to death by Lygdamus, the tyrant of Halicarnassus.

Paoli, PASQUALE, 1726–1807. Corsican patriot, who overthrew the Genoese 1755 and ruled the island wisely till 1769; expelled by the French, to whom it was sold 1768; thenceforth (except 1789–96, when he was Gov. of Corsica) in England, where he was pensioned and highly honored.

Paolo, FRA. See SARPI, PIETRO.

Paolo Veronese. See VERONESE, PAOLO.

Papacy. System under which the Pope is supreme head of R.C. Ch., involving till 1870 temporal as well as spiritual power.

Papal States, or STATES OF THE CHURCH. Former domain of the Pope, in central Italy, touching both seas, but of irregular form, bordering Naples on the s., and Tuscany and the Austrian territory on the w. and n. The boundaries have varied greatly, but at their greatest extent included ab.16,000 sq. m., with over 3,000,000 inhabitants. The claim of the Holy See was built on a grant of Pepin the Short to Stephen II. 755, confirmed by Charlemagne. These states formed a part of France 1808–14. Most of their territory was added to the kingdom of Italy 1860, and Rome itself Sept. 1870, the Vatican and Lateran palaces only remaining under the Pope's direct control.

Paparrigopoulos, CONSTANTIN, b. 1815. Modern Greek historian. *L'Histoire du peuple grec*, 6 vols., 1862–77; *l'Histoire de la civilisation hellénique*, 1878.

Papaveraceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab.19 genera and 80 species of herbs, distributed throughout the temperate and subtropical regions of the n. hemisphere; called the Poppy family.

Papaw. *Carica papaya.* Small soft-wooded tree of the natural family *Caricaceæ*, native of tropical America; cultivated in warm countries for its large, yellow, edible fruit.

Papaw, NORTH AMERICAN. *Asimina triloba.* Small tree of the natural family *Anonaceæ*, bearing large, edible fruits, native of the s.e. U. S.

Papayotin. Amorphous hygroscopic powder precipitated by adding alcohol to the juice of Carica papaya. It transforms proteids into peptones.

Paper. Manufactured from PAPYRUS (q.v.); it was in use in Egypt 4,000 years ago, and in Europe till 12th century, when paper made from cotton began to take its place. The Romans made a stout brown paper from the bark of trees 300–600. The Aztecs used the fibers of the maguey plant for the same purpose. The Arabs had paper-factories ab. 600, using raw cotton as the material, having learned the art from the Chinese. By the Arabs it was taken to Spain, whence it spread to other European countries. Italy started its first paper-mill 1250, Germany 1290, France 1340, England ab.1500, America 1690, at Roxborough, now in Philadelphia. The materials of which paper is made are numerous; the most important are linen and cotton rags, hemp, jute, straw, esparto and wood fibers. After cleansing by boiling with lime, the paper stock is reduced to fine fibers in water by the beating engine, consisting of a cylinder with knives revolving on a plate also furnished with knives, contained in a trough. The bleaching is done with chloride of lime, the excess being removed by washing and hyposulphite of soda. For sizing, a mixture of rosin, caustic soda, and alum is added to the pulp, and for colored papers the aniline colors are largely used. Much of the paper is loaded with mineral matter which is mixed with the pulp, the most common being china clay. The prepared pulp is suspended in water, strained, and run upon the paper machine. In the preparation of pulp from straw or wood, the material is subjected to the action of caustic soda in hot water under pressure, which dissolves the silica and interfibrous matter; for wood pulp sulphite of lime is used, in the same manner, to a

Paper Making in China.

large extent. The finest writing paper is made from linen rags. It is estimated that three-fourths of the paper is used for printing. In 1890 Europe produced ab. 1,049,800 tons of paper, valued at $150,000,000, and the U. S. produced 1,200,000 tons.

Paper Car Wheel. Wheel having the main body of compressed cardboard, while the hub, tire, and sides are of cast iron or steel.

Paper Hangings. These were used in Holland and Spain for wall and ceiling decoration before 1555. They are made by cylinder printing; the finer kinds are printed from wooden blocks. Velvet paper is printed with varnish and flock shearings of woolen cloth dropped upon it.

Paper-Mache. Paper pulp, paper in sheets with paste or glue, or pasteboard are pressed in molds. After drying, the articles are polished and ornamented. The art is ancient in the East.

Paper Money. Either certificates convertible on demand into coin, or inconvertible notes. The latter may be issued by the government as a fiscal measure, or may be notes originally intended to be convertible but which have lost that character through subsequent exigencies. First made by the Hollanders 1574.

Paper Shell. Spherical shell of cartridge paper containing a bursting charge of powder and combustible compositions for the production of pyrotechnic display; usually fired from an 8-in. smooth-bore mortar.

Paphlagonia. State of n. Asia Minor, on the Euxine; conquered by Crœsus; under Roman rule, part of Galatia.

Paphos. Two towns on w. coast of Cyprus. One was a chief seat of the worship of Venus, who was said to have risen from the sea near it. At the other St. Paul preached before Sergius.

Papias, d. ab.163. Supposed disciple of St. John; Bp. of Hierapolis in Phrygia; author of an *Exposition of Oracles of the Lord*, of which fragments remain. His doctrine was millenarian in character.

Papilionaceous. Irregular polypetalous flowers of plants of the Pea family (*Leguminosæ*).

Papilionidæ. Family of *Lepidoptera*, including Butterflies. They have knobbed antennæ and erect wings when at rest. Their pupa is a chrysalis. They fly by day only. There are 5,000 species.

Papin, DENIS, 1647–ab. 1712. French scientist, who invented the loaded safety-valve ab.1680, and in 1690 constructed a working model in which first appeared the idea of having steam move a piston in a cylinder. The safety-valve was an attachment to P.'s DIGESTER (q.v.), in which he studied the effects of heat upon confined vapor, and of which the principle is retained in certain processes for treating animal matters in the arts.

Papineau Rebellion. 1837–38 in Canada; improperly named from Louis Joseph Papineau (1789–1871), leader of the French party. It was promptly suppressed: 180 were sentenced to be hanged; some were executed, some banished, and some pardoned. A general amnesty was declared 1840. Papineau came back from France 1847, and was later in the Canadian Parliament.

Papinianus, ŒMILIUS, d. 212. Most eminent of Roman jurisconsults; high official under Septimius Severus. From his 59 books 595 passages were admitted to the Pandects.

Papin's Digester. See DIGESTER.

Papoose. North American Indian child, usually fastened upon a board and carried on the back of the mother or hung up out of harm's way.

Papoose.

Papoose-Root. See COHOSH, BLUE.

Pappenheim, GOTTFRIED HEINRICH, GRAF VON, 1594–1632. Marshal of German empire; distinguished at Prague 1620; associated with Tilly and Wallenstein in the Thirty Years' War; killed at Lützen.

Pappus. Crown of hairs, bristles or scales which surmounts the achenes of plants of the Composite family, being the modified teeth of the calyx.

Pappus, OF ALEXANDRIA. Greek mathematician, probably of 3d century. His *Collection*, in 8 books, but lacking the first and part of the second, was pub. 1876–78.

Papuans. Natives of New Guinea and Melanesia, of NEGRITO (q.v.) blood; resembling the Australians. They tattoo by cutting and scarring the skin, use bows and arrows, paint their bodies, dye their hair, which is abundant and receives great care, and hang huge ornaments in ears and through the nasal septum. Their toes are partly prehensile. Their clothing is but a fringed girdle and a head dress. Cannibalism is practiced. They use communal houses, erected on piles over water and reached by boats. They are head-hunters like the DYAKS (q.v.). They cultivate land, but have no private ownership, and depend mainly on hunting and fishing. They love to barter. Trial by fire and witchcraft obtain among them, and rude wooden images of the dead are prayed to.

Papyrus. *Cyperus papyrus.* Sedge or reed, native of Asia and Africa; formerly growing in marshes of the Nile valley, 4 to 6 in. in diameter and 8 to 12 ft. high; still found in some parts of Nubia and Abyssinia, the Jordan valley, and Sicily. The Romans cultivated it in some wet lands of Italy, but obtained their chief supply from Alexandria. It was used by the Egyptians in the manufacture of various articles, as

Papyrus.

boats, cordage, sandals, and writing paper. This last was made by placing one layer of the pith crosswise upon another and uniting them by a diluted gum and pressure. A sheet might be 7 to 16 in. in width, or several sheets might be glued end to end. Even in Egypt it was so dear as often to be used a second time (see PALIMPSEST). In the British Museum is a papyrus over 135 ft. long.

Par. In Business Arithmetic, sign of equality between apparent and real values, or between values expressed in different monetary units.

Para. City of Brazil, on the P.; commercially important. Pop. 40,000.

Para. S.e. outlet of the Amazon, after receiving the Tocantins; 20 to 40 m. wide; separated from the main stream by Marajo Island.

Para. Turkish coin of copper or base silver; fortieth of a piastre.

Parabasals. See DICYCLIC CRINOIDS.

Parables. Comparisons; especially our Lord's illustrations of the kingdom of heaven by brief narratives, fictitious in form, or by references to familiar human relations or natural processes. This mode of teaching was used by none of the Apostles.

Parabola. See CONIC.

Parabolas, GENERAL. Curves whose equations have the form $y^m = 2px^r$.

Parabolic Comets. Comets whose orbits as determined do not differ appreciably from parabolas. They comprise 200 out of 270 computed orbits.

Parabolic Governor. See GOVERNOR.

Parabolic Semaphore. Semaphore signal whose arm is bent to a parabolic curve, so as to reflect along the track the light of a lantern placed in the focus of the curve. It is arranged to show red when in a horizontal position, and white or green when inclined at the position of safety.

Parabolic Spindle. Solid formed by revolving a parabola about a double ordinate perpendicular to the axis of the curve.

Parabolic Spiral. One defined by the equation $\rho^2 = a\delta + b$, where a and b are arbitrary constants; or $(\rho - r)^2 = 2p\delta$, where r is the radius of a fixed circle and 2p the constant of a parabola.

Paraboloid of Revolution. Solid formed by revolving a parabola upon its axis: its volume is one-half that of a cylinder having the same base and altitude.

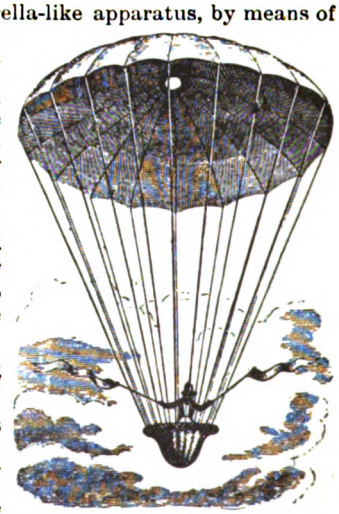
Parabranchium. Gill-like organ on left side of neck in Prosobranchs, near the true ctenidium. It represents the olfactory organ (osphradium) of the original right side.

Paracellulose. Modification of cellulose, soluble in cupro-ammonia after treatment with dilute acids.

Paracelsus (PHILIPPUS VON HOHENHEIM), 1493–1541. Swiss physician and philosopher, who read and traveled widely in search of medical learning. He introduced new remedies and methods of treatment; taught a sort of pantheism, combining the Cabbala with natural science; and was a mixture of charlatan, investigator, and reformer. *Chirurgia Magna; Hermetic Writings*, tr. 1894. See CHEMISTRY and ALCHEMY.

Parachordals. Cartilaginous bars, one on each side of the anterior end of the notochord, in Vertebrate embryos.

Parachute. Large umbrella-like apparatus, by means of which a man can descend from a balloon, the velocity of fall being not dangerously great. The top is sometimes 16 ft. in diameter, and has an aperture in the center, through which the air rushes and thus prevents any oscillations which might cause accident.



Parachute.

Parachute. In Mining, attachment above a hoisting cage, to prevent fall in case of breakage of the cable, and to protect persons on the cage from falling bodies.

Parachute. Fold of skin on each side of the body of Flying Squirrels, etc., which, during their soaring leaps, is stretched between the fore and hind limbs and acts as an aeroplane.

Paracme. That part of the life of an organism from maturity to death; characterized by the gradually increasing effects of senesence.

Para Compounds. When used as a prefix, see the main portion of the word; *e.g.*, for Paratoluidine see Toluidine. See META COMPOUNDS.

Paractiniæ. See MALACODERMATA.

Paracyanogen. Polymeric modification of cyanogen. $(C_2N_2)_n$. Black solid, obtained by heating mercuric cyanide. By heating strongly it is converted back to cyanogen.

Paradise. 1. Garden of Eden. 2. Abode of the blessed; either heaven or intermediate state.

Paradise, BIRDS OF. Gorgeous passerines of the Malaysian region. The Great Bird of Paradise is 18 in. long, of rich brown and purple. In the male the head is yellow above, green below; the feet are pink; in the tail are two cirri, 3 ft. long; under each wing is a golden plume, 2 ft. long. The

Bird of Paradise (*Paradisea rubra*).

female lacks plumes and varied colors, and, as is usual among animals, the young males resemble the females. In other species the side plumes are crimson. In the King-bird of Paradise they are fan-shaped. Some species have wonderful crests, and their plumage glows like brilliant gems.

Paradise, or PARVIS. Open space surrounded with a coping of masonry in front of a cathedral or other important building.

Paradise Lost. Milton's purpose to write a great epic was formed as early as 1639. On his return to England from the Continent he was occupied in the choice of a subject. A list of those considered remains; 61 were Scriptural, 38 from British History. The first on the list was finally chosen. For a time he wavered between a dramatic and an epic treatment. During the 20 years of his controversial life the poem was laid aside. It was taken up 1658, and was nearly finished 1663. It appeared 1667 in 10 books; the 2d ed., 1674, had 12, books VII. and X. being subdivided, and 8 lines added in books VIII. and XII.

Paradise of the West. See SUKHAVATI.

Paradox. Apparent contradiction in terms, usually conveying a weighty truth; *e.g.*, "He that findeth his life shall lose it."

Paradoxides. Middle Cambrian Trilobite, sometimes attaining a length of 20 in.

Para-Epididymis, or PARADIDYMIS. Remains of posterior part of Wolffian body in the male, near the epididymis. See VASA ABERRENTIA.

Paraffin. Sp. gr. 0.87, mpt. 50°–60° C., bpt. 370° C. It separates as a solid from the heavy oils which are obtained by the distillation of the high boiling portion of petroleum. It is also obtained from wood tar, and by the distillation of shales and brown coal. It consists of $C_{22}H_{46}$ to $C_{28}H_{58}$ hydrocarbons, and is used for making candles, as a wax for coating insulated wires, and in chewing gum. Crude Pa. petroleum contains ab. 2 per cent. It occurs in the mineral OZOKERITE (q.v.). It is a white solid, soluble in naphtha, ether and oils; also in hot alcohol, but separates in crystalline needles on cooling.

Paraffins. Hydrocarbons corresponding to the symbol C_nH_{2n+2}. So marsh gas, CH_4, is a paraffin; also texone, C_6H_{14}, and solids, as $C_{28}H_{58}$. The paraffins are also called alkyl hydrocarbons.

Paraflagellum. Flagellum of small size and secondary importance, situated on a flagellated Infusorian which has one or more large principal flagella.

Parafuchsine. $C_{19}H_{20}N_3ClO_4$. Pararosaniline hydrochloride; prepared as in the case of fuchsine, except that para compounds alone are used in connection with aniline, and that less toluidine or nitrotoluene is used. It is similar to fuchsine, and can be used for the same purposes. It is especially used in the manufacture of dye-stuffs.

Paragaster, or PARAGASTRIC CAVITY. Cavity of a simple sponge, single or branched, before any special differentiations of the endoderm cells arise; primitive cavity of the sponge gastrula.

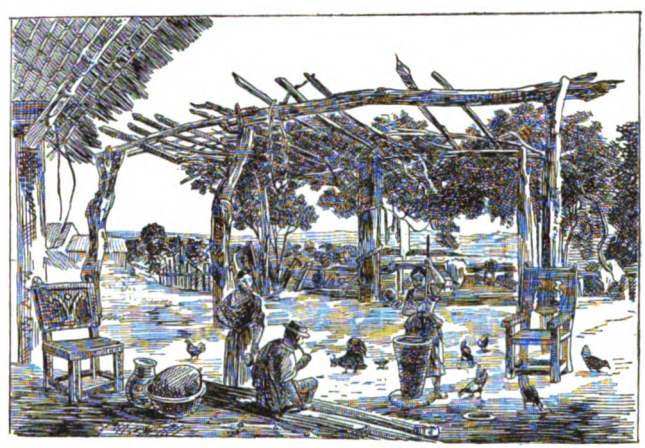
Paragastric Canals. Two canals that open from the bases of the primary radial canals of Ctenophores, on each side of the œsophagus. They pass to and end blindly near the mouth.

Paragastrula. Peculiar gastrula found in sponges. It originates from an amphiblastula by invagination of the flagellated cells, leaving the granular cells outside to become the elctoderm.

Paraglossæ. Secondary pieces borne on the sides of the glossa or ligula of insects.

Paragonite. Mineral resembling common mica, but containing sodium instead of potassium. It gives character to the rock known as paragonite schist.

Paraguay. Republic of S. America, between Brazil and Argentine Republic; 22°–27° S. lat. and 54°–64° W. long. The surface is hilly in the north. In its middle portion it consists of forested plains, while in the south it becomes low and marshy. Its area is ab. 142,000 sq. m. The capital, Asuncion, was founded 1536. In 1620 P. proper was separated from



Ranch in Paraguay.

Buenos Ayres, and both put under the vice-royalty of Peru. In 1776 Buenos Ayres was made a vice-royalty and P. placed under its jurisdiction. It declared its independence of Spain 1811, but became a despotism 1814 under Dr. Francia. C. A. Lopez came to power 1841. His son, F. S. Lopez, engaged in destructive wars 1864–70, from which P. has since been slowly recovering. Pop. ab. 400,000.

Paraguay. River tributary to the Parana or Rio de la Plata, rising in Brazil and forming part of the Bolivian boundary; discovered by Cabot 1526. Length ab.1,800 m., partly navigable.

Paraguay Tea. See MATÈ.

Paraheliotropism. In Plant Physiology, movement of leaves into a position parallel with the rays of light.

Parakeets, or PARRAKEETS. Old World Parrots, with long wedge-shaped tail. In the New World is the corresponding family of MACAWS (q.v.). *Conurus*, the Carolina Parrot or Parakeet, is now restricted to Florida and in danger of becoming extinct. Its general color is green: the head is yellow, the forehead red.

Paraldehyde. $C_6H_{12}O_3$. Colorless liquid, boiling at 124° C.; produced from acetaldehyde by bringing the latter in contact with sulphuric acid. It has a disagreeable taste, but is largely used as a soporific.

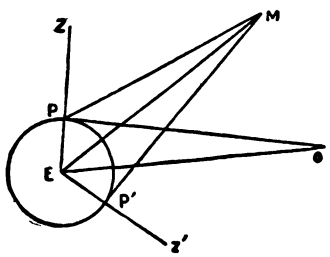
Parallactic Angle. Angle at a star, formed by arcs of great circles drawn to the pole and zenith.

Parallactic Inequality OF THE MOON. Change in the sun's disturbing effect upon the moon's motion, due to variation of the sun's distance. Thus when the moon describes

that half of its orbit nearest the sun, the effect of the latter is greater than while the other half is described.

Parallactic Orbit OF A STAR. A star which has a measurable parallax appears to describe a small orbit with a period of one year. The orbit is an ellipse whose semi-major axis is equal to the annual parallax. The motion is only apparent, being due to the earth's annual motion about the sun.

Parallax. Difference in apparent position of a body as seen from two points. The diurnal parallax of a planet is the difference in apparent position as seen from the center of the earth and a point on the surface. The annual parallax of a star is the angle at the star subtended by the radius of the earth's orbit. The equatorial horizontal parallax of the sun or a planet is the parallax when seen in the horizon from a point on the earth's equator.



Parallax of a heavenly body M.

Parallax, SOLAR. Angle at the center of the sun, subtended by the earth's equatorial radius. Various methods have been employed for measuring its value, the most important being by transits of Venus across the sun's disk, by observation of Mars near opposition, and by the velocity of light. Some of the values which have been found for this constant are as follows: Ptolemy 3′, Cassini 9.5″, Encke 8.5776″, Newcomb 8.848″. Most recent determinations about 8.79″. Calculated from this the distance of the sun from the earth is about 93,000,000 m.

Parallax of Fixed Stars. Only a few cases have been found of measurable value. A few of the most important are as follows:

Star.	Magnitude.	Right Ascension.	Declination.	Authority.	Method.	Parallax.
Polaris.	2.	1h. 22m.	88° 46′	Peters.	Meridian Circle.	0″.073
Sirius.	—1.4	6h. 41m.	—16° 35′	Gyldén.	Meridian Circle.	.193
				Gill & Elkin.	Heliometer.	.380
Castor.	1.5	7h. 28m.	32° 6′	Johnson.	Heliometer.	.198
Procyon.	1.	7h. 34m.	5° 29′	Auwers.	Micrometer.	.123
Groombridge.	6.5	11h. 7m.	38° 32′	Mean of 5 values.	Micrometer.	.114
Arcturus.	1.	14h. 11m.	19° 42′	Peters & Johnson.	Mer. C. & Helion.	.132
α-Centauri.	1.	14h. 33m.	—60° 25′	Gill & Elkin.	Heliometer.	.750
α-Lyræ.	1.	18h. 34m.	38° 41′	Mean of 6.	Various.	.161
61 Cygni.	5.5	21h. 2m.	38° 15′	Mean of 8.	Various.	.421

Parallel. Having the same direction. Parallel lines or planes have no finite intersection and are everywhere equidistant. In Modern Geometry they are considered as meeting at infinity, lines in a point, planes in a line.

Parallelism. Peculiarity of Hebrew poetry, which has neither meter nor rhyme, but repeats the same thought in slightly varying clauses.

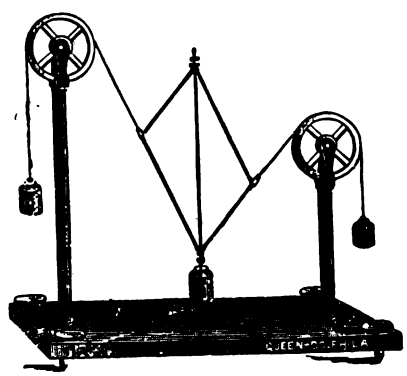
Parallelism, CONDITIONS OF. The geometrical conditions for parallelism of two straight lines are modifications of the definition. If two lines be perpendicular to a third: or both parallel to a third: or make alternate interior angles equal, or the sum of the interior angles on one side of the transversal equal to two right angles, they are parallel. If the lines are given by their equations, they will be parallel when their slopes are equal; $y = mx + b$, $y = m^1x + b^1$ are parallel if $m = m^1$.

Parallelism, PLANE. Two planes are parallel when, their equations being solved in respect to one variable, the coefficients of the other two coördinates are respectively equal.

Parallel Motions. Systems of pivoted linkages, by means of which one of the points of the rods is compelled to move in a straight line; used to guide the end of piston rods of steam engines in cases where a crosshead and its guides would be inconvenient. The best known of these linkages are Watts' parallelogram, the "grasshopper," and Evans' motions, and their modifications. The Peaucellier cell and the White hypocycloidal gear (the latter also as modified by Tchebischeff of Russia) make elegant constructions, but have not been much used in practice. Such linkages are restricted in U. S. to vertical beam engines for pumping purposes.

Parallelogram. Quadrilateral having its opposite sides parallel: they are also equal. The area of a parallelogram equals the product of its base and altitude, or the product of two adjacent sides and the sine of their included angle.

Parallelogram of Forces. If two forces can be represented in magnitude and direction by the two adjacent sides of a parallelogram, the diagonal of the parallelogram colinear with the two forces will represent their resultant in magnitude and direction. The case is applicable to two velocities or two accelerations, and so we have the parallelogram of velocities and that of accelerations. In general, the principle can be applied to any two directed quantities whatever.


Parallelogram of Forces.

Parallelopiped. Prism the bases of which are parallelograms. If the lateral edges are perpendicular to the base, it is a right parallelopiped: if in addition the bases are rectangles, it is rectangular. The volume of a parallelopiped equals the product of its base and altitude. The name Cuboid has been suggested for the rectangular parallelopiped.

Parallels. Open earthen trenches parallel to the front of the fortification against which siege operations are to be conducted. In the conduct of actual sieges five or more have been found necessary.

Parallel Sphere. Celestial sphere as seen by an observer at the pole, where all the heavenly bodies would appear to describe circles parallel to the horizon.

Parallel Variation, or ANALOGOUS VARIATION. Form of variation in which two independent lines of descent mimic each other in various divergent lines of development; *e.g.*, (1) where similar eyes are produced in the widely separated descendants of an eyeless ancestor; (2) dentition of the marsupials, which in Australia shows Insectivorous, Carnivorous, Rodent, Herbivorous, etc., groups, analogous to similar groups forming other phyla of Mammals.

Paralogism. Fallacy in reasoning which deceives the subject; distinguished from a sophism, which deceives others only.

Paralysis. Complete or partial loss of function of any muscle or sets of muscles caused by the disease or injury of the nerve energizing the muscles. Either motion or sensation, or both, may be affected.

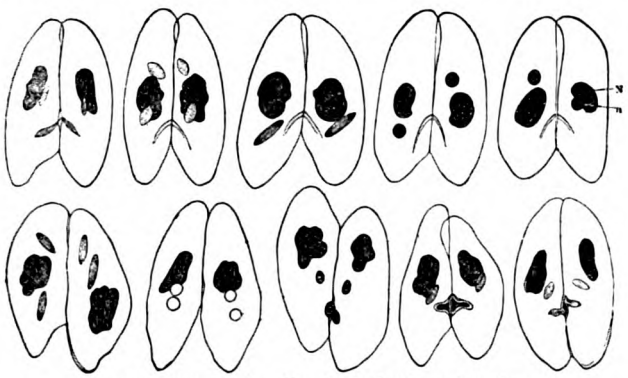
Paramagnetic. See MAGNETISM.

Paramaribo. Capital of Dutch Guiana, on the Surinam, 18 m. from its mouth. Pop., 1890, 28,831.

Paramastoid Process. Jugular process; eminence on each occipital.

Paramecium. Genus of holotrichous *Infusoria*, shaped like a slipper twisted slightly about its longitudinal axis, and of size just visible to the naked eye. The mouth is in one edge near the middle. The front end is the heel of the slipper. There are two contractile or pulsating vacuoles, a macronucleus or endoplast, and a micronucleus (endoplastule). A definite proctal region is present. The cortex (ectosarc) contains

trichocysts. In conjugation, this animalcule shows itself hermaphroditic. During the temporary copulation of two similar individuals, the macronucleus of each breaks up and disappears, the micronucleus of each becomes four, two of which are



Paramecium aurelia. Two individuals conjugating.

lost and one of the remaining migrates into the other *paramecium* and unites with the residual nucleus forming a zygote, the process being mutual. Each zygote divides into a macro- and a micronucleus.

Parameres. 1. Right and left halves of a metamere. 2. Actinomeres of a radiate. 3. Similar parts that are repeated in any appendage, as the fingers or toes. The last is the best usage. See ANTIMERE.

Parameters. Constants which determine the specific character or position of a locus: any specific locus may be designated by its parameters: the line whose equation is $2x + 3y + 4 = 0$ may be named as the straight line (2, 3, 4).

Paramitas. Virtues of Buddhism: Charity, moral conduct, patience, fortitude, meditation, and wisdom. Also truth, steadfastness, kindness, and imperturbability.

Parana. River of S. America. It rises in e. Brazil, flows w. and s.w., forming the e. and s. boundary of Paraguay, then s. through Argentina, after joining the Paraguay, and with the Uruguay forms the Rio de la Plata. Length ab. 2,000 m., drainage area ab. 1,200,000 sq. m.

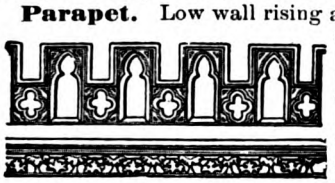
Paranahyba. See PARNAHYBA.

Paranoia. Form of mental disease. While there is a defective nervous organization from birth, the manifestations of mental alienation are frequently so slight as to mislead an expert. Youthful precocity, some eccentricity of conduct, or a slight morbidness may be the only manifestation. Many of the enthusiasts and cranks of the world, who are able to carry on complex affairs to a successful termination, are but illy-balanced paranoiacs. Were it not that the disease tends to chronicity and not to cure, and, as it progresses, seizes its victims with delusions leading to crime, it may be to homicide, it might be classed as a harmless affection.

Paranucleolus. In Plant Cytology, secondary nucleolus.

Paranucleus. Secondary nucleus, sometimes seen in different cells, outside the principal nucleus. In *Protozoa* it is the micronucleus or endoplastule; in eggs it is the yolk nucleus. Accessory nuclei are present in nearly all sorts of cells, but are probably not homologous structures.

Parapet. Low wall rising above a roof, anciently used for defense and crenellated for that purpose, but in modern buildings serving only to protect persons on the roof from falling. It is a common feature in mediæval and modern architecture.



Ornamented Gothic Parapet.

Parapetalous. Stamens at the sides of petals.

Parapets. Earthen covers to protect artillery and infantry troops and material from the fire of the enemy, and arranged to permit an effective fire to be delivered upon every point in their front. They should be at least one and a half times as thick as the penetration of the projectiles fired against them.

Paraphernalia. Apparel and ornaments of the wife, which have been furnished by the husband and belong to her, over and above her dower. The Roman *parapherna* corresponded to the wife's separate estate under modern statutes.

Paraphlegia. Loss of motor power in both legs. See PARALYSIS.

Paraphragm. Process of the endosternite, which passes outward, upward, and forward to unite with the endopleurite of its own and the preceding segment, in the endophragm of lobster-like *Crustacea*.

Paraphrase. Expansion of a text of whatever length; intended to elucidate it.

Paraphrases, SCOTTISH. Versifications of Scripture, prepared by order of General Assembly 1742–45, and authorized for private use 1751; revised 1781, when 22 were added. They were widely used and drawn upon. The chief authors were W. Cameron, M. Bruce, and J. Morison; some are by Blair, Blacklock, Ogilvie, and others; 8 are anonymous.

Paraphyllum. Leaf-like expansion or appendage, not a true leaf.

Paraphyses. Barren filaments accompanying the reproductive organs of many of the lower plants.

Paraplegia. Paralysis affecting the lower extremities.

Parapodia. Bristle-bearing, unjointed appendages, borne on the sides of the segments of a chætopod worm.

Parapophysis. Ventral portion of the transverse process, in the rib-bearing (dorsal) vertebræ; it is short, close to the centrum, and articulates with the head (capitulum) of the rib.

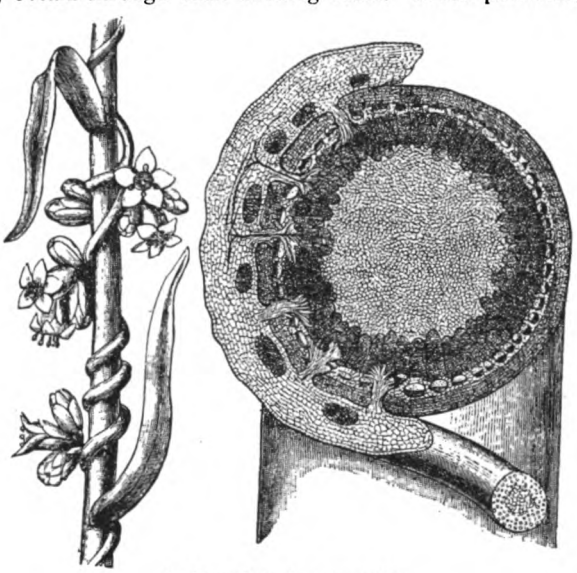
Parapterum. See SCAPULARS.

Pararosaniline. $(C_6H_4.NH_2)_3C.OH$. Triamidotriphenylcarbonol; made by the oxidation of paraleucaniline. Its properties and derivatives are analogous to those of ROSANILINE (q.v.), made by oxidizing a mixture of aniline and paratoluidine with arsenic acid.

Parasang. Persian measure of distance, according to Herodotus, equal to 30 stadia, or ab. 3½ English miles.

Paraselena. Bright spot on either side of the moon as seen in lunar halos, similar in origin to the Parhelia.

Parasites. Plants existing on the juices of others, which they obtain through their sucking roots. Green parasites, as



Dodder (*Cuscuta glomerata*).

the Mistletoe, are able to form some organic matter, but the pale parasites, containing no chlorophyll, must obtain their food already elaborated: such are the Beech Drops and Dodder. Animal parasites are divided into ectoparasites (Louse, Bedbug, etc.), and endoparasites (Tapeworm, Trichina, etc.). See ENTOZOA and PEDICULIDÆ.

Parasitica. See ANOPLURA and APTERA.

Parasitic Diseases. Those induced by vegetable or animal parasites. Animal parasites are such as trichina, tick, scabies, lice, tapeworm, etc. Vegetable parasites include thrush, ringworm, and actinomycosis.

Parasphenoid. Dagger-shaped bone which covers the under side of the cranium in the frog, fish, and other *Ichthyopsida*.

Parastamen. See STAMINODIUM.

Parastichies. Secondary spirals, occurring in some methods of alternate leaf-arrangement.

Parauchenia. Sides of the neck in birds.

Parcæ. Three goddesses of Fate, sisters of Fortune, of whom Clotho puts the wool on the spindle, Lachesis spins it, and Atropos cuts the thread (of man's life). They are conceived both as birth and as death-goddesses.

Parc aux Cerfs. Deer-park laid out at Versailles by Louis XII.—Also a beautiful retreat of Mme. de Pompadour.

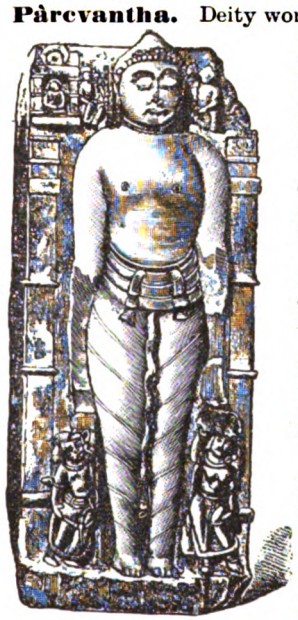
Parcenary. Common-law estate by descent to co-heirs. Modern legislation in the U. S. has changed it to a tenancy in common.

Parchesi. Ancient Hindu game, played upon a board in the form of a cross by two or four players, each with four men. In India, in the game called Pachisi or Twenty-five, from which the American game is borrowed, the moves are made according to the throws with Cowrie shells. In our game dice are employed; the corresponding Hindu dice game is called Chansar. From internal evidence it appears that pachisi was originally cosmical and divinatory, the four arms of the cross being referable to the four directions. An almost indentical game was played by the ancient Mexicans under the name of Patoli. The latter is regarded by many as conclusive evidence of the Asiatic origin of Mexican culture, but is likely to have developed independently in Asia and America. Pachisi is widely diffused in Asia, from the Philippine Islands to Syria, where it is known as Edris. It was introduced into the U. S. 1865.

Parchment. Dried skin, brought into use ab. 190 or 160 B.C. at Pergamus in Asia Minor, as a substitute for papyrus, the exportation of which from Egypt had been prohibited. The skins are unhaired, stretched, dried, planed and rubbed with pumice stone. Sheep-skins are used for diplomas; calf-skins are used for drum heads.

Parcimony. Law of economy in explanation of phenomena, requiring the fewest possible causes necessary to an effect. Two or more causes should never be supposed when one is adequate to the result.

Pàrcvantha. Deity worshiped by the Jains, regarded as the 23d Tirthankara, personages corresponding to Buddhas. He was born in Benares, and is said to have died at the age of 100 years in 823 B.C. His color is blue: a serpent is his emblem.



Parcvantha.

Pardee, ARIO, 1810–1892. Capitalist at Hazleton, Pa.; owner and operator of coal mines; benefactor of Lafayette College.

Pardessus, JEAN MARIE, 1772–1853. Prof. Paris 1810; deputy; writer on commercial law.

Pardo, MANUEL, 1834–1878. Banker of Lima; pres. of Peru 1872–76; exemplary and highly useful; murdered while pres. of senate.

Pardo Bazan, EMILIA (SIGNORA QUIROGARICHE), b. 1852, m. 1868. Spanish realistic novelist and critic.

Pardoe, JULIA, 1806–1862. English novelist, descriptive and historical writer. *Louis XIV.*, 1847.

Pardon. Relief of an offender from his penal liabilities: in the U. S. generally regulated by constitution and statutory provisions.

Paré, AMBROISE, 1517–1590. French army-surgeon, inventor of ligatures for the arteries in amputations; surgeon to Henry II., 1552, and to his successors; important as a reformer of surgical practice and benefactor of humanity. *Chirurgie*, 1562.

Paredes, JOSÉ GREGORIO, 1779–1839. Peruvian scientist and statesman.

Paredes y Arrillaga, MARIANO, 1797–1849. Mexican general and revolutionist.

Paregoric. Camphorated tincture of opium of the Pharmacopœia, containing 0.4 per cent of opium; a soothing medicine.

Parenchyma. Proper substance of a tissue after differentiated parts are excluded. Its cells are usually numerous, and quite similar.—In Botany, vegetable tissue composed of cells but little longer than broad, and with thin cell-walls, forming the softer portions of plants, such as leaf-pulp, pith, and certain layers of the bark. *Algæ* are entirely composed of it.

Parenchymatous. Resembling or consisting of parenchyma.

Parenchymula. Mouthless planula, whose segmentation cavity has become filled with endoderm cells.

Parent and Child. The parent has a legal right to the custody, discipline, and services of his unmarried minor child, and is under a legal duty to maintain, protect, and educate him.

Parepa-Rosa, EUPHROSYNE DE BOYESKU, 1836–1874. Concert and opera singer in Great Britain and the U. S. Her father was a Wallachian, her mother English. She was married to Carl Rosa 1867.

Paresis. See GENERAL PARALYSIS.

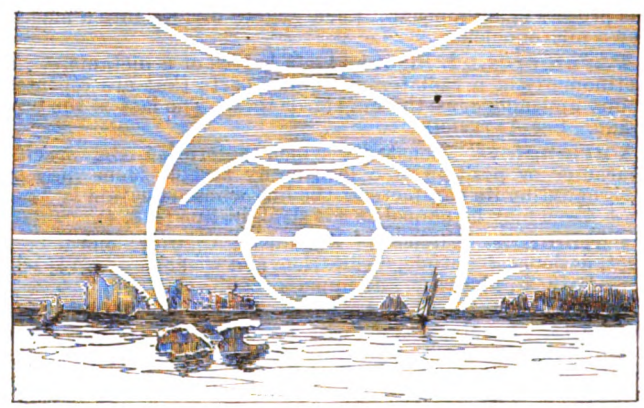
Paresthesia. Abnormal sensation, as formication, a feeling as if ants were crawling over a person; also produced by aconite poisoning.—Also abnormal sensations of cold or heat.

Parfait, NOEL, 1814–1896. French author and deputy.

Parga. Albanian town, opposite Corfu; connected with Venice 1401–1797; then held by Turkey. Its people revolted, and in 1819 most of them removed.

Pargeting. Decoration of plaster work by stamping before the material has dried and set.

Parhelion. Bright spots right and left of the certical plane through the observer and sun as seen in complete halos; due to the reflection of the sunlight from a number of small



Parhelion, or Mock-Sun, in the Polar Seas.

planes. They are usually seen at angular azimuths from the sun of ab. 20°, 25°, 46°, 50°, 90°, or 120°; that which occurs at 180° is the Anthelia.

Pariahs. Lowest caste in s. India, with whom members of the higher castes refuse intercourse.

Paridigitata. See ARTIODACTYLA.

Parietal. In Botany, ovules or placentæ borne on the wall of the ovary.

Parietal Bones. Two upper bones of the skull of vertebrates.

Parieto-Splanchnic. Ganglion in bivalve Mollusks, on the posterior adductor muscle.

Parieu, ESQUIROU DE, b. 1815. French economist, Minister of Public Instruction 1849; writer on taxation, finance, and currency.

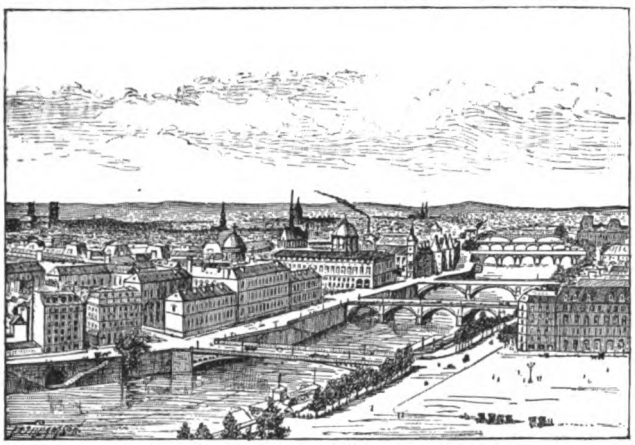
Parima. 1. Branch of the Rio Negro, in n. Brazil. 2. Mountains of Guiana and e. Venezuela.

Parini, GIUSEPPE, 1729–1799. Italian poet, prof. at Milan from 1773. *Il Giorno*, Part I., 1763; II., 1765; III., IV., 1801.

Paripinnate. Pinnate leaves with an even number of leaflets, arranged in pairs, as in the wild Senna.

Paris. Capital of France, on the Seine, 110 m. from the sea. After London and New York, it is the largest city in the world. It is regularly laid out, with many broad and well-paved avenues and numerous public parks. Its sewage system and water supply are excellent. It contains many magnificent public buildings and institutions of learning and arts. It was mentioned by Cæsar; was long confined to an island of the Seine, but was extended by Romans to either bank. It was occupied by Clovis 506; decayed under Carlovingians; was besieged by Northmen 885; became the residence of Hugh Capet 987; was enlarged and greatly improved under later kings; was the scene of the massacre of St. Bartholomew 1572, of several sieges and many revolutions. The university was founded ab. 1200, the Sorbonne 1252, the Academy 1666. Louis XIV. changed the old ramparts into boulevards, established drainage and sewerage, and various public institutions. The Reign of Terror, 1793–94, was most terrible here. After the Revolu-

tion Napoleon added new quays, bridges, markets, and other improvements, and embellished the city with the fruits of his conquests. The progress arrested by his downfall was resumed by Louis Philippe. Under Napoleon III. P. was transformed. Long streets were constructed connecting the finest squares,



Paris, as seen from the Church of St. Gervais.

public buildings, and a double circle of spacious boulevards. The plans interrupted by the Franco-German war have since been further carried out. Many fine buildings were destroyed by fire during the outbreak of the Commune; most have since been restored. The exhibitions of 1855, 1867, 1878, and 1889 took place here. Area 30 sq. m.; pop., 1891, 2,447,957.

Paris, or ALEXANDER. Son of Priam; brought up as a shepherd. He adjudged the golden apple to Venus, and so drew on Troy the hatred of Juno and Minerva. By carrying off Helen, wife of Menelaus of Sparta, he brought on the Trojan war.

Paris, ALEXIS PAULIN, 1800–1881. Prof. Coll. of France 1853–72; prolific writer on French literature.—His son, GASTON BRUNO PAULIN, b. 1839, Academician 1896, succeeded to his chair and carried on his other labors. *Charlemagne*, 1866; *Poetry of the Middle Ages*, 1885.

Paris, DECLARATION OF. See DECLARATION OF PARIS.

Paris, JOHN AYRTON, M.D., D.C.L., 1785–1856. English scientist, inventor of the tamping-bar. *Pharmacologia*, 1819; *Medical Jurisprudence*, 1823.

Paris, LOUIS PHILIPPE ALBERT D'ORLEANS, COMTE DE, 1838–1894. Grandson of Louis Philippe; on Gen. McClellan's staff in Va., with his brother and uncle, 1861; Deputy 1871; Legitimist heir to the throne from 1883; exiled 1886, and thenceforth in England.

Paris, MATTHEW, ab. 1200–1259. English Benedictine and Latin chronicler. His *Historia Major* extends to 1259.

Paris, PLASTER OF. See CALCIUM SULPHATE.

Paris, UNIVERSITY OF. Originated 1109 in a school of logic taught by William of Champeaux, who was succeeded by Abelard. By 1150 there were said to be more students in Paris than citizens. Soon after 1600 its 40 colleges were deserted; but it was soon revived. It suffered from the strifes of Jesuits and Jansenists, and was suppressed with other institutions 1793.

Paris Green. Copper arsenite. $CuHAsO_3$; used as a pigment; made by precipitating a solution of copper sulphate with sodium arsenite.

Paris Yellow. See LEAD CHROMATE.

Parish. Smallest division of territory under an established Ch.; in England the officers administered the poor-laws and had charge of the highways, but these functions have been largely transferred to other Boards; in America, aggregate of persons and interests in a local religious society.

Parish Clerk. Minor ch. official in England.

Park. Piece of ground in an untilled state used as a game reserve or for walking or driving; also a tract of land kept for ornament and public recreation. The Egyptians had parks at a time much earlier than the records on the monuments show. Parks then were little more than a cluster of gardens. The Romans attached parks to their villas. Pompey and Hortensius among others had large parks. In England the first great park particularly mentioned is Woodstock, formed by Henry I. 1125. The following are some of the best known parks: Fairmount, Philadelphia, 2,740 acres; Bois de Vincennes, Paris, 2,075; Phœnix, Dublin, 2,000; Bois de Boulogne, Paris, 2,000; Prater Gardens, Vienna, 1,500; Golden Gate, San Francisco, 1,100; Central, New York, 862; Druid Hill, Baltimore, 600; Hyde, London, 598; Prospect, Brooklyn, 515; English Garden, Munich, 500; Regents, London, 472; Victoria, London, 300; Thiergarten, Berlin, 200; Bois de la Cambre, Brussels, 124. See YELLOWSTONE PARK.

Park, EDWARDS AMASA, D.D., b. 1808. Prof. Andover 1836–81; ed. *Bibliotheca Sacra*, 1851–84.

Park, MUNGO, 1771–1805. Scottish explorer in Africa 1795–97 and 1805; drowned in the Niger, after descending it ab. 1,500 m. *Travels*, 1799.

Parke, JOHN GRUBB, U.S.A., b. 1827. Brig.-gen. U.S. Vols. 1861, Major-gen. 1862–66; Col. of Engineers 1884; Supt. at West Point 1887–89. *Rivers and Harbors*, 1877–87.

Parker, AMASA JUNIUS, LL.D., 1807–1890. Vice-chancellor of N. Y. 1844–47; Judge of N. Y. Supreme Court 1847–55; Lecturer in Albany Law School. *Criminal Cases*, 6 vols., 1860–68.

Parker, FOXHALL ALEXANDER, U.S.N., 1821–1879. Captain 1866; Commodore 1872; Supt. Naval Academy 1878. *Fleet Tactics*, 1863; *Naval Howitzer*, 1865–66.

Parker, GILBERT, b. 1862. Anglo-Canadian novelist. *Chief Factor*, 1891; *Trespasser*, 1894; *Seats of the Mighty*, 1895.

Parker, HORATIO WILLIAM, b. 1863. Prof. Yale 1894; organist, and composer of cantatas. *Hora Novissima*.

Parker, SIR HYDE, R.N., 1739–1807. Captain 1763; knighted 1779 for the capture of Savannah; Rear-admiral 1793; commander in the Baltic 1801.

Parker, ISAAC, LL.D., 1768–1830. M.C. 1797–99; Judge Mass. Supreme Court 1806; Chief-justice from 1814; Law Prof. Harvard 1816–27. His decisions were praised by Story.

Parker, JAMES CUTLER DUNN, b. 1828. American composer of 3 cantatas, *Redemption Hymn*, *St. John*, and *The Blind King*.

Parker, JOEL, 1795–1875. Judge N. H. Supreme Court 1833; Chief-justice 1836; prof. Dartmouth 1847, and Harvard from 1857; legal writer.

Parker, JOEL, LL.D., 1816–1888. Gov. of N. J. 1863–66 and 1871–74; Judge N. J. Supreme Court from 1880.

Parker, JOSEPH, D.D., b. 1830. Minister of the City Temple, London, since 1874. *Ecce Deus*, 1868; *Ad Clerum*, 1870; *People's Bible*, begun 1885.

Parker, MATTHEW, D.D., 1504–1575. Dean of Lincoln 1552, Abp. of Canterbury 1559, being regularly consecrated at Lambeth by four bishops. See NAG'S HEAD.

Parker, SIR PETER, R.N., 1721–1811. Captain 1747, Baronet 1782. He attacked Charleston, and bore part in the taking of New York and R. I.—His grandson, SIR PETER, R.N., 1786–1814, destroyed much property along the Chesapeake, and was killed at Chestertown, Md.

Parker, PETER, M.D., 1804–1888. Missionary in China 1834–40 and 1842–55; U. S. Commissioner there 1855–57.

Parker, SAMUEL, D.D., 1744–1804. Rector of Trinity Ch., Boston, 1779; P.E. Bp. of Mass. 1804.

Parker, THEODORE, 1810–1860. Pastor in Boston from 1837; leader of the radical Unitarians; a man of genius, who by his sermons and publications exerted great influence on religious thought. *Works*, 12 vols., 1863–65.

Parker, WILLARD, M.D., LL.D., 1800–1884. Prof. New York 1839–83; pres. N. Y. Inebriate Asylum, Binghamton, 1865; eminent as operator, teacher, and discoverer.

Parker, WILLIAM KITCHEN, F.R.S., 1823–1890. Prof. London 1873–83; writer on anatomy.

Parkersburg. City of W. Va., 63 m. n. of Charleston, at the junction of the Ohio and Little Kanawha rivers. It is the outlet of the petroleum region and has a number of oil refineries. Pop., 1890, 8,400.

Parkes, SIR HARRY SMITH, 1828–1885. English ambassador to Japan 1865–83, and then to China.

Parkes, SIR HENRY, b. 1815. Premier of New South Wales 1872 and later.

Parkesine. Name given to celluloid, it having been first made by A. Parkes.

Parkhurst, CHARLES HENRY, D.D., b. 1842. Presb. pastor in New York since 1880; pres. Soc. for Prevention of Crime 1891. His fearless activity in reform led to an investigation of the N. Y. Police Department by the Lexow Committee 1894, and in the fall to the most memorable political upheaval in the history of any American city. *Our Fight against Tammany*, 1895.

Parkhurst, JOHN, 1728–1797. English author of a *Hebrew Lexicon*, 1762, long used, and of a *Greek Lexicon to N. T.*, 1769.

Parkinson, JOHN, 1567–1650. English herbalist. *Paradisus Terrestris*, 1629; *Theatrum Botanicum*, 1640.

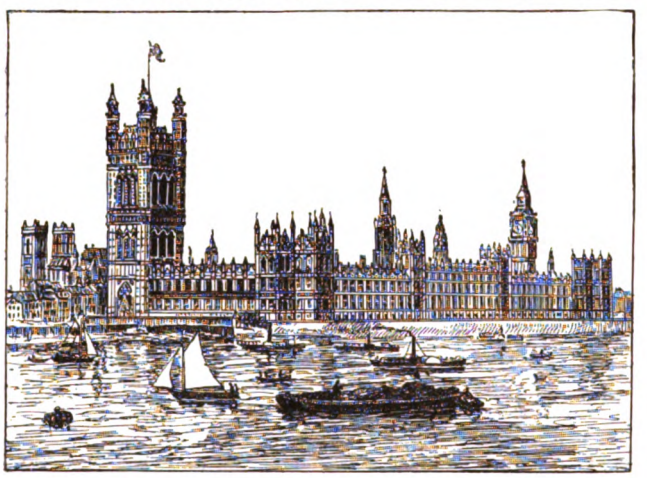
Parkinson-Fortescue, CHICHESTER SAMUEL, b. 1823. M.P. 1847; member of several cabinets; Baron Carlingford 1874; Lord Privy Seal 1881–85.

Parkman, FRANCIS, 1823–1893. American historian of high rank. His chief works relate to the French period in colonial history, and are noted for their full research, entire fairness, keen insight, and graphic style. *Oregon Trail*, 1849; *Conspiracy of Pontiac*, 1851; *Pioneers of France in the New World*, 1865; *Jesuits in N. America*, 1867; *La Salle*, 1869; *Old Regime in Canada*, 1874; *Frontenac and New France*, 1877; *Montcalm and Wolfe*, 1884; *A Half Century of Conflict*, 1892.

Park Range. Part of the Rocky Mountain system in Colorado and s. Wyoming, standing as the west wall of the series of Parks. Its peaks range from 13,000 to more than 14,000 ft. in height.

Parley, PETER. See GOODRICH, SAMUEL GRISWOLD.

Parliament. Legislative body, especially that of Great Britain, consisting of the sovereign, the House of Lords, and the House of Commons. The latter is elective and contains (1896) 670 members—465 for England, 30 for Wales, 72 for Scotland, and 103 for Ireland. The other comprises 549 lords temporal and 26 lords spiritual. Of this the Lord Chancellor is always Speaker. Of the lords temporal 16 Scottish peers are elected for each parliament and 28 Irish peers for life. Its duration was fixed 1716 at 7 years. It is generally in session



London—The Houses of Parliament, as seen from Lambeth.

from about Feb. 15 to end of Aug. in each year. In case a majority of the Commons votes against the Government, the ministry resigns or dissolves parliament and orders a new election. It is the successor of the *Witenagemote* of early Saxon times. *Magna Charta*, 1215, provided for the convening of Parliament whenever money was to be raised. Writs are still in existence by which in 1265 Henry III. summoned the knights and burgesses. The division of Parliament into two houses dates about a century later. See LONG PARLIAMENT and RUMP PARLIAMENT.

Parliamentary Law. According to the rules and usages of Parliament or to the established rules and practices of legislative bodies. Usually in the U. S. the rules and practices of Congress are followed.

Parliaments, IN FRANCE. Law courts. That of Paris was the chief law court of the realm, charged with registering the royal edicts. In 1789 there were 13 parliaments in France, differing in extent of jurisdiction, that of Paris covering a third of the kingdom.

Parlor Cars. Length about 60 ft., width 10 ft., weight 60,000 lbs., cost $10,000, seating capacity 32. Nearly all the parlor and sleeping cars of the U. S. are owned by the Pullman and Wagner Companies, and used by the railroads under contract.

Parma. City of n. Italy, on the P., 12 m. s. of the Po; built by Etruscans; subject to Rome 183 B.C.; capital of a duchy 1545–1731 and 1814–60. Its university, founded 1599, has ab. 40 teachers and near 300 students. The palace contains some fine paintings and a library of 214,000 vols. Some of the churches are notable. Near here an Austrian army encountered the allied forces of France, Spain, and England, June 29, 1734, and Russians under Suwarrow routed the French under Macdonald June 19, 1799.

Parma, DUKE OF. See FARNESE and CAMBACERES.

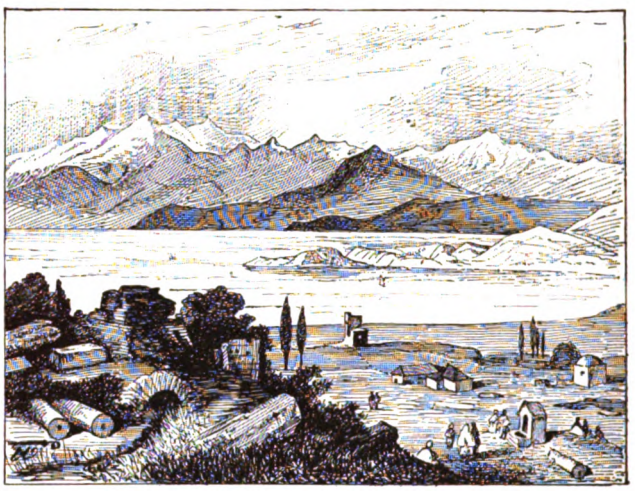
Parmenides, 5th cent. B.C. Greek philosopher of Elea in Lucania, famous for the doctrine that there is only one eternal unchangeable substance, and that change is an illusion.

Parmigiano (GIROLAMO MAZZOLA), 1504–1540. Italian painter.

Parnahyba. River of n. Brazil, flowing n.e. to the Atlantic. Length ab. 750 m., drainage area 150,000 sq. m.

Parnassiens. French school of poets ab. 1866, who gave almost exclusive regard to form.

Parnassus. Mountain n. of Delphi, chief seat of Apollo and the Muses; sacred also to Dionysus. The Castalian Spring



Parnassus and Helicon, with the Gulf of Corinth.

issued from between two cliffs above Delphi. The highest peak was the scene of the orgies of the worship of Dionysus. Altitude 8,068 ft.

Parnell, CHARLES STEWART, 1846–1891. M.P. 1875; founder and first pres. of Irish Land League 1879; leader of Home Rule party 1880; taken into alliance by Gladstone 1886, who attempted to pass a Home Rule bill with his aid; vigorously attacked by *London Times*, which published certain letters alleged to be his, indicating complicity with acts of violence on the part of the Irish peasantry, but afterward proved to be forgeries of one Pigott. For this libel he obtained $20,000 damages. In Nov. 1890 he became co-respondent in a suit for divorce and later married the woman in the case. His leadership was consequently refused by the majority of the Home Rule party, but a section adhered to him till his death.

Parnell, THOMAS, 1679–1717. Irish poet; archdeacon of Clogher 1705. A volume containing *The Hermit* and other well-known poems appeared 1722, and another, of doubtful authenticity, 1758.

Parodies. Facetious imitations of well-known productions, usually in verse. They were found among the Greeks ab. 550 B.C., and form part of every national literature. Among the most notable modern examples are some of H. and J. Smith's *Rejected Addresses*, 1812, Aytoun & Martin's *Ballads by Bon Gaultier*, 1851, Calverley's *Fly-Leaves*, 1871, and in prose Bret Harte's *Condensed Novels*, 1867, and Burnand's *New Sandford and Merton*, 1872.

Paræcious. Mosses in which the archegonia and antheridia are borne in close proximity.

Par-of-Exchange. Amount of money which has to be paid in one place for a bill of exchange of a certain face value, payable at another place.

Parole. Promise of a prisoner not to escape, go beyond bounds, or resume hostilities, according to the degree of liberty granted him; esteemed sacredly binding in military circles.

Parol Evidence. Not in writing; inadmissible to vary or contradict a written instrument. The exceptions to this rule are numerous.

Paro-ophoron. See VASA ABERRENTIA.

Paropamisus. Range of mountains in n. Afghanistan.

Paros. One of the Cyclades, in the Ægean Sea; noted for its marbles, called Parian. Pop., 1890, 3,048.

Parostosis. Ossification in the dermis, forming exoskeletal bones.

Parotid Gland. Largest of the salivary glands, seated under the ear and near the angle of the lower jaw. It weighs 1 oz. and discharges its secretions into the mouth opposite the second molar tooth in the upper jaw

Parotitis. Infectious disease attacking children and young persons most frequently, in which the parotid and other salivary glands become swollen. Treatment consists of regulation of diet, mild purgatives, and vegetable acids as lemonade as a beverage. In males the testes and spleen often swell and in females the ovaries and mammæ. Suppuration of the glands scarcely ever occurs. It is also called Mumps, and in Scotland Branks.

Parovarium. See EPO-OPHORON.

Parquetry. Flooring of oak and other wood, laid in blocks to form a mosaic.

Parr. See SALMO.

Parr, CATHERINE, 1512–1548: 6th wife of Henry VIII., married at 12 to Edward Borough, who died 1529; at 17 to Lord Latimer, who d. 1542: to the king July 1543; and 1547 to Sir Thomas Seymour. She was distinguished for her learning, especially of religious subjects.

Queen Catherine Parr, Painted by Holbein.

Parr, SAMUEL, LL.D., 1747–1825. English teacher, in his time of great fame for learning, which his works, 8 vols., 1828, fail to support.

Parr, THOMAS, 1483–1635. English marvel of longevity, called "Old Parr." See LONGEVITY.

Parrhasius, 4th cent. B.C. Most famous of Greek painters, except perhaps his rival Zeuxis.

Parricide. In modern acceptance, murder of a parent; in Roman law, that of any near relative, and peculiarly punished.

Parris, ALBION KEITH, 1788–1857. M.C. 1815–19; Gov. of Me. 1821–26; U.S. Senator 1826–28; Judge of Me. Supreme Court 1828–36.

Parris, SAMUEL, 1653–1720. Minister at Salem, Mass., 1689–96; promoter of the witchcraft delusion, which began in his family 1692, and of 20 judicial murders caused thereby.

Parrish, JOSEPH, M.D., 1779–1840. Practitioner in Phila. *Hernia*, 1836.—Of his sons, JOSEPH, M.D., 1818–1891, was noted as an alienist and for the care of inebriates; EDWARD, 1822–1872, an eminent pharmacist, was pres. of Swarthmore Coll. 1868–70.

Parrish, STEPHEN, b. 1846. American landscape painter and etcher.

Parrot Coal. Cannel coal, which makes a crackling noise in burning.

Parrots. Order PSITTACI (q.v.), including 430 species, 9 families, and 45 genera, nearly all tropical. Some are brilliantly colored, some very plain. The size ranges from that of the sparrow-like LOVE-BIRDS (q.v.) to the MACAWS (q.v.). They associate in flocks in forests, are vegetarian, and have harsh voices, but some are good imitators of sounds. The Kaka of New Zealand has taken to eating mutton, attacking even live sheep, from which it tears the flesh. See also COCKATOOS and PARAKEETS.

Parrott, ENOCH GREENLEAF, U.S.N., 1814–1879. Distinguished on the Atlantic coast 1861–65; Admiral 1873.

Parrott, ROBERT PARKER, 1804–1877. U.S. officer 1824–36; inventor of rifled cannon and projectiles.

Parrott Gun. Cast-iron, muzzle-loading, rifled gun, having a wrought-iron band shrunk over the breech in rear of the trunnions. They were extensively used during the Rebellion in the field, siege, and seacoast artillery, up to 300 lbs. They were not always reliable, for some would burst after a few rounds, while others would stand the full service life of 1,000 rounds.

Parrott Projectile. Elongated cast-iron projectile arranged to take the rifled motion by means of a brass band cast on the butt of the projectile. Upon being fired the powder gas expanded the band and drove it into the grooves of the rifling, thus causing the projectile to take the rifled motion.

Parry, CHARLES CHRISTOPHER, M.D., 1823–1890. Botanist to several Western surveys; writer on botany.

Parry, CHARLES HUBERT HASTINGS, b. 1848. English composer. Prof. Royal College of Music. *Art of Music*, 1893.

Parry, SIR WILLIAM EDWARD, R.N., 1790–1855. Arctic explorer, knighted 1829, Rear-admiral 1852. In 1820 he won £5,000 by going farther west than any before him; in 1827 he reached 82° 45′ N. lat., the highest till 1876. *Journal*, 1824; *Narrative*, 1828.

Parry Sound. Village in the district at the e. extremity of P. S., an inlet of Georgian Bay. Pop. 1,500.

Parsees. Remnant, in Persia and w. India, of the adherents of Zoroastrianism, the ancient religion of Persia. They worship one god, specially symbolized by fire, and are eminent for activity, business capacity, thrift, and probity. They refuse to eat food prepared by one of a different faith, do not bury their dead, but place them on towers that the birds may clean the bones, which are collected and buried. They number ab. 8,000 in Persia and 85,000 in India, chiefly at Bombay. See GUEBERS and DISPOSAL OF THE DEAD.

Parsee Hotel Keeper.

Parsley. *Petroselinum sativum.* Herb with finely cut leaves, of the Carrot family, native of the Mediterranean region, widely cultivated as a flavoring herb.

Parsley, FOOL'S. *Æthusa cynapium.* White-flowered, poisonous herb of the Carrot family, native of Europe; introduced as a weed into N. America.

Parsnip. *Pastinaca sativa.* Yellow-flowered, coarse herb of the Carrot family, native of Europe, extensively cultivated for its edible roots, and introduced as a weed into N. America. Parsnips are occasionally grown as a field crop, solely as a cattle food. They are especially valuable for milch cows. The cultivation is essentially like that given for beets, though care must be taken that the seed is fresh and vigorous. The common parsnip easily runs wild, when it becomes an unsightly and troublesome weed.

Parsnip, MEADOW. Plants of the genus *Thaspium*, yellow-flowered herbs of the Carrot family, natives of e. N. America.

Parsnip, WATER. Marsh herbs of the genus *Sium*, natural family *Umbelliferæ*, natives of the n. temperate zone.

Parson. Parish priest of English church; so called because by his person the church is represented. He is a corporation sole, holding legal title to the temporalities of his parish.

Parsons, ALFRED WILLIAM, b. 1847. English landscape artist. *Notes in Japan*, 1895.

Parsons, or **Persons,** ROBERT, 1546–1610. English Jesuit, much dreaded by Elizabeth; missionary at home 1580–81; founder of schools in Spain and France; rector English College at Rome 1598–1610. His *Christian Directory*, 1583–91, was revised by Dean Stanhope 1700; other books of his were considered treasonable.

Parsons, SAMUEL HOLDEN, 1737–1789. Brig.-gen. U.S.A. 1776; Major-gen. 1780; Judge of Northwest Territory 1788.

Parsons, THEOPHILUS, LL.D., 1750–1813. Chief-justice of Mass. Supreme Court from 1806.—His son, THEOPHILUS, LL.D., 1797–1882, was prof. Harvard Law School from 1847. *Law of Contracts*, 1853; *Maritime Law*, 1859; *Partnership*, 1867; *Marine Insurance*, 1868.

Parsons, THOMAS WILLIAM, 1819–1892. American poet. Tr. Dante's *Inferno*, 1867.

Partative Force. Greatest weight a magnet can support. That of a saturated horseshoe magnet may, according to Hücker, be given by the formula,

$$P = a\sqrt[3]{p^2},$$

in which p is the weight of the magnet, and a a coefficient depending for its value upon the nature of the steel and the method of magnetization.

Parthenius, OF NICÆA, 1st cent. B.C. Greek writer of prose and verse. Some romances survive.

Parthenogenesis. Formation of sperm cells by asexual processes; known in both vegetable and animal kingdoms; development of eggs without fertilization. Every egg which the queen-bee lays either is fertilized or is not: the former develop into workers (females), the latter become drones (males). The males are therefore parthenogenetically produced. In other cases, as in Plant-lice, the parthenogenetic generations are usually females.

Parthenon. Temple of Athene Parthenos (virgin) on the Acropolis at Athens, built at command of Pericles by Ictinus and Callicrates 444–438 B.C. The temple platform measures 228 by 101 ft., having 15 Doric columns 35 ft. high on either side and 8 on each end. The sculptures of pediment, metopes, and frieze were wrought and placed under direction of Phidias. In the cella was his world-famed chryselephantine statue of

The Parthenon.

the goddess. In the Middle Ages the Parthenon became a church dedicated to the Virgin, and then a mosque. It was nearly destroyed by an explosion of gunpowder 1687, during the siege of Athens by the Venetians. Many of the remaining sculptures of the pediments and frieze were wrenched from their position by Lord Elgin, and are now in the British Museum. See ARCHITECTURE.

Parthenopean Republic. In Naples, Jan. 1799; the Bourbons were reinstated the following June. Parthenope was an ancient town on the site of Naples, named from one of the Sirens, whose tomb was shown there.

Parthenosperms. Reproductive bodies borne by certain *Algæ* of the order *Conjugatæ*, resembling zygosperms, but produced independently of the process of conjugation; parthenospores.

Parthia. Country of Asia, s.e. of the Caspian, whose warriors were famed for their skill in horsemanship and archery; subject to Persia and the Greek kings of Syria until Arsaces moved a revolt and set up an independent monarchy ab. 255 B.C. The Parthian empire was established ab. 174 B.C. by Mithradātes I., who conquered Media, Susiana, Persia, Babylonia, and Bactriana. Mithradates II., "the Great," 124–87 B.C., extended the empire in several directions, but lost Armenia. A Roman expedition against P. under Crassus, 54 B.C., was a bad failure. The Parthians defeated the Romans again 51 and 40, and made themselves masters of Syria, but were checked 39 in an attempt to conquer Asia Minor. Antony's great expedition, 36 B.C., ended disastrously. From this time for 150 years there were no more open wars with Rome, but in 114 A.D. Trajan conquered a large part of the Parthian empire, to be surrendered however 117. P. became dependent on Rome 165, and the empire came to an end 226 through a revolt of the Persians. At its height, it extended from the Indus and the Ocean to the Euphrates and the Oxus.

Parthian Arrows. Discharged by horsemen in apparent retreat.

Partial Contraction. Stream of water issuing from an orifice and contracted only on one or two sides, owing to rounded edges of the orifice or to a wall on one side. The contraction is then said to be partially suppressed.

Participation in Profits. See INDUSTRIAL PARTNERSHIP.

Participle. Adjective formed from a verb. When active, it often carries the force of both parts of speech.

Particle. In Mechanics, smallest mass upon which force may be supposed to act. A particle may have a motion of simple translation, but as it is assumed to occupy the volume of a geometrical point only, it cannot rotate. Indeed, since in many problems particles are assumed to have different masses, the idea of non-rotation or zero volume seems to be the most important.

Parting. Layer of slate, dirt, or other valueless material, occurring in a seam of coal.

Partition. Division of property between joint or co-tenants, so that each may have exclusive possession of his share. It may result from the mutual consent of the parties or be adjudged in a legal action.

Partition, WALL OF. Wall in Jewish Temple, beyond which none but Jews were allowed to go, on pain of death. St. Paul declares that Christ has broken this down, by admitting all believers in Him to equal privileges.

Partnership. Relation subsisting between persons carrying on a business in common with a view of profits. Whether this relation exists in a particular case is generally determined by the intention of the parties, as evinced by their acts. Each partner is a general agent for the firm and may bind it by acts within the apparent scope of his authority. A person may make himself liable as a partner by holding himself out as such, and thereby inducing others to become creditors of the supposed firm. The liability of partners for firm debts is joint, and for firm torts joint and several. The entire fortune of each partner is liable for firm obligations; the equity rule, however, for distributing to firm and separate creditors is to give firm creditors the preference in the firm estate and separate creditors priority in the separate estate. Each partner is bound to exercise the utmost good faith toward his associates, and cannot introduce another into the firm without consent of all its members.

Parton, JAMES, 1822–1891. American author of English birth; biographer of Greeley, 1855; Burr, 1857; Jackson, 3 vols., 1860, and others. *Captains of Industry*, 1884–91.—His wife, SARAH PAYSON ("FANNY FERN"), 1811–1872, was a sister of N. P. Willis, whom she satirized in a novel, *Ruth Hall*, 1854, and a once popular writer.

Part Ownership. Title in two or more to personal property, without right of survivorship or right to force partition.

Partridge, WILLIAM ORDWAY, b. 1861. American sculptor; author of the Shakespeare in Lincoln Park, Chicago, a bronze Hamilton, and an equestrian statue of Grant in Brooklyn; noted also for portraits and ideal subjects.

Partridge-Berry. *Mitchella repens.* Low evergreen plant of the Madder family, bearing red berries, native of e. N. America; also Wintergreen.

Partridge-Pea. *Cassia chamæcrista.* Yellow-flowered herb of the Pea family, native of N. America.

Partridges. Different genera of the family *Tetraonidæ.* The most common of the Old World is *Perdix*, the Gray Part-

Partridge (*Perdix communis*).

ridge. The Snow Pheasants of the heights of the Himalayas may exceed 6 lbs. in wt. The Gray Partridge of India is not

palatable as food, but, being very pugnacious, is kept for fighting; the male has two spurs on each foot. There are 9 genera and 45 species of American Partridges, among which are the Mountain Quail of Cal., the Bob-White of e. U. S., called Quail north and Partridge south, while the RUFFED GROUSE (q.v.), *Bonasa umbellus*, is called Partridge north and Pheasant south. It is shy and forest-loving; the male makes a drumming sound by vibrating its wings. Its tarsus is feathered half way, the head crested, and plumage variegated. Length 18 in. The tail consists of 18 soft, broad feathers. See SAND GROUSE and QUAILS.

Parts of Speech. The earliest forms of language seem to have been (a) pronominal and (b) verbal: a combination of these produced the verb and its differences of person, to which number, tense, and mood were added. The noun, or substantive, and the adjective were early developed from the root. with endings to express case, gender, and number. Verb and substantive (covering, of course, pronoun and adjective), therefore, with their varieties of inflection, include all the original parts of speech. Adverbs are either fossilized cases (*e.g.*, *whilom* is a dative plural, *while* an accusative singular, of the noun *while*), or are made by a suffix, such as *-ly*, from an older equivalent of *like*. Prepositions, as the name implies, were once prefixes of the verb. Conjunctions are of later origin; thus *that* in "I see that you are blind," was once "You are blind, I see that." Interjections hardly count as parts of speech, and stand outside of syntactical relations.

Part Song. Musical composition, in three-voiced harmony or more, generally of a secular character, homophonic, and sung without accompaniment.

Party Wall. One standing on or near a real property line, in which the adjoining proprietors have rights in common.

Parveyance. Obsolete right of buying provisions and other necessaries for use of government at an appraised valuation, and without regard to the consent of the owner.

Parvin, THEOPHILUS, M.D., LL.D., b. 1829. Prof. Jefferson Medical Coll., Phila., 1883. *Obstetrics*, 1886.

Pasadena. City of Cal., 10 m. n.n.e. of Los Angeles; winter resort. Pop., 1890, 4,882.

Pasargadæ. Ancient capital of Persis, said to have been founded by Cyrus on the site of his victory over Astyages; its ruins are near Murghab.

Pascagoula. River of s.e. Mississippi, flowing s. to a bay on the Gulf. Length 85 m., drainage area 8,980 sq. m.; navigable.

Pascal, BLAISE, 1623–1662. French philosopher, theologian, and mathematician, famous for his attack on the Jesuits in the *Provincial Letters*, 1656, in defense of his friend Arnauld and the Jansenists, and for his paradoxical and half skeptical

Blaise Pascal.

doctrines in the *Thoughts*, 1669; writer on Conic Sections, 1640; first to determine the properties of the cycloid; founder of the doctrine of mathematical probability, and discoverer of the weight of the air and the existence of a vacuum.—His sister, JACQUELINE, 1625–1661, was a nun at Port Royal from 1652.

Pascal's Principle. See HYDROSTATICS.

Pascal's Theorem. A hexagon being inscribed in a conic and the pairs of opposite sides being produced, the points of intersection lie in the same straight line.

Paschal I. Pope 817–824. Also an antipope 687, d. 694.—II. RANIERI, ab. 1050–1118; cardinal ab. 1076, pope 1099. He excommunicated Henry IV. of Germany, and was imprisoned by Henry V.—III. Antipope 1164–68.

Paschal Controversies. Between East and West, as to the time and manner of Easter observance.

Pasha. Turkish title, first of princes, since of governors, officers, or favorites; of three degrees, 1, 2, or 3 horsetails being the standard and emblem of rank.

Pasini, ALBERTO, b. 1820. Italian-French painter.

Pasiphäe. Wife of Minos, King of Crete: mother of Ariadne, Phædra, and the Minotaur.

Paskevitch, IVAN FEODOROVITCH, COUNT OF ERIVAN, PRINCE OF WARSAW, 1782–1856. Russian Field-marshal; active against the French 1812–14. In 1825 he conquered Persian Armenia, taking Erivan; in 1828–29 he took Kars and Erzerum from the Turks. He crushed the Polish revolt 1831, and was Gov. of Poland, joined the Austrians to quell the Hungarian insurrection 1848; and was defeated by the Turks 1854.

Paso del Norte. Mountain pass, which is the chief thoroughfare between Mexico and New Mexico.

Paspatis, ALEXANDER GEORGE, LL.D., 1814–1891. Greek author, who wrote also in French and English; once a Turkish slave; educated in America and France; physician in Constantinople 1840–78; prof. at Athens 1878.

Pasqualis, MARTINEZ, 1715–1779. Jewish cabalist, active among French Freemasons; founder of the Martinists.

Pasque-Flower. *Pulsatilla patens*, and other species of showy-flowered herbs of the Buttercup family, natives of the n. hemisphere. The leaves are narcotic, acrid, and poisonous, and

Pasque-Flower (*Pulsatilla pratensis*).

contain anemonine. The extract is a favorite medicine of the homœopathists. It bears blue bell-shaped flowers, the petals of which are used to color Easter eggs purple.

Pasquino, ANTONIO, d. ab. 1500. Tailor in Rome, noted for his quips and witty sallies. His name was given to a broken statue found near his stall, to which anonymous lampoons were affixed by night. Hence pasquinade.

Pass. Mill or opening left in the deads through which ore falls to loading place.

Passagians. Semi-Jewish sect in Italy, condemned 1184.

Passaglia, CARLO, 1812–1887. Prof. at Rome 1844–57, and at Turin from 1861; expelled by Jesuits 1859 for attacking the temporal power and urging Italian unity; Deputy 1863.

Passaic. City of P. co., N. J., 11 m. n.w. of Jersey City; on the P. It has some manufactures. Pop., 1890, 13,028.

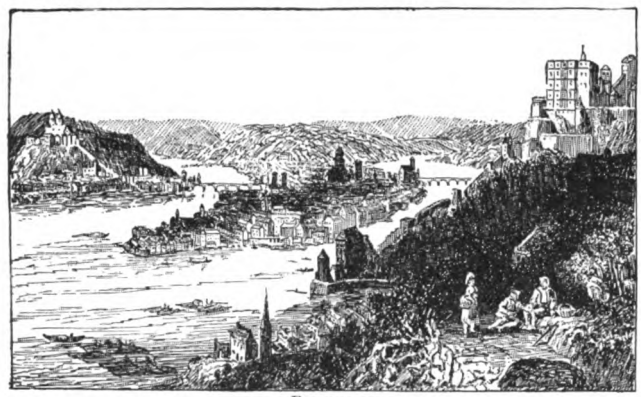
Passaic River. In the n.e. of N. J., flowing e. then s. past Paterson and Newark into Newark Bay.

Passamaquoddy Bay. Between Me. and New Brunswick, at mouth of Bay of Fundy; ab. 10 m. by 15.

Passarowitz. Town of Servia, 40 m. s.e. of Belgrade. Here a treaty was signed July 21, 1718, ending the Turkish war against Venice, and securing part of Wallachia, Servia, and Bosnia to Austria. The Turks held the Morea. Pop. ab. 10,000.

Passau. Old town of Bavaria, on the Danube, Ilz, and Inn. By a treaty signed here Aug. 1552 toleration was granted to the Lutherans. It was an old Roman camp and has strong

fortifications and considerable manufactures and trade. Pop., 1890, 16,633.



Passau.

Passavant, JOHANN DAVID, 1787–1861. German painter, head of the Städel Institute at Frankfort; author of an important *Life of Raphael*, 1839–58.

Passavant, WILLIAM ALFRED, D.D., 1821–1894. Lutheran pastor at Pittsburg 1844–55; ed. *Missionary* 1848–61, and *Workman* from 1880; founder of hospitals, orphanages, and of the Chicago Theol. Sem. 1891; introducer of deaconesses for hospital work 1849. Much of his work is carried on by his son and namesake, b. 1857.

Passenger Cars. Length 60 ft., width 10 ft., weight 60,000 lbs., cost $5,000, seats 60. The average life of passenger cars is 16 years. In U. S. 1895 there were 26,419 passenger cars.

Passerat, JEAN, 1534–1602. French poet and satirist; prof. Coll. of France 1572.

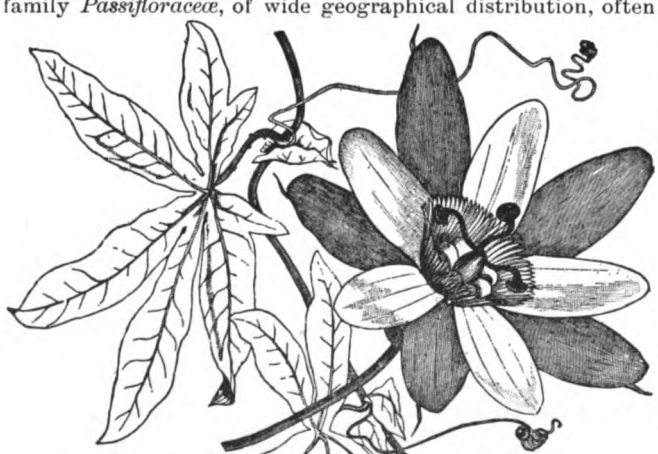
Passeres (CORACOMORPHÆ, INSESSORES, PERCHERS). Order of Birds containing many of small size, generally good flyers, using their feet mostly for perching; when on the ground they usually hop. The beak is horny, without cere; the young are altrices. A vocal apparatus (syrinx) is usually present. They have been artificially grouped into the *Oscines*, or singers, and the *Clamatores*, or shriekers; but similar varieties of beaks occur in both groups, according to which we have five tribes: LEVIROSTRES, TENUIROSTRES, FISSIROSTRES, DENTIROSTRES, and CONIROSTRES (q.v.). They are monogamous, migratory, gregarious, and build skillfully constructed nests. The Levirostres are frequently placed with the CUCULI (q.v.).

Passeroni, CARLO GIOVANNI, 1713–1803. Italian lyric poet.

Passifloraceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 27 genera and ab. 235 species, all growing in the tropics and warm regions bordering thereon; called the Passion-Flower family.

Passion. Desires or affections when uncontrolled by the reason or by moral rules.

Passion-Flower. Vines of the genus *Passiflora*, natural family *Passifloraceæ*, of wide geographical distribution, often



Passion-Flower (*Passiflora cærulea*).

cultivated for their beautiful flowers and in the tropics for their fruits, which are edible, especially those of the genus *Granadilla*.

Passionists. R.C. order founded 1720 in Piedmont, confirmed 1741, introduced in England 1842, and 1852 in the U.S., where they now have many houses.

Passion Play. See MYSTERIES, MIRACLE-PLAYS, and OBERAMMERGAU.

Passion Week, or HOLY WEEK. Last of Lent, preceding Easter. Strictly this is Holy Week, the preceding being Passion Week.

Passion Music. Settings of the history of Christ's passion, as drawn from the Gospels and performed in the service of Holy Week in the German Church. By the 4th century the recital took on a quasi-dramatic character; the story was chanted dialogue interspersed with choruses. In the Western Church ab. 1200–1570 the recital was divided between three deacons, one of whom sang the words of the evangelist, the second those of Christ, the third those of the apostles and spectators, plain chant melodies being used. Subsequently the cries of the people were set to simple polyphonic music in Italy, and ab. 1690 in Germany the ch. chants were set aside and the entire Passion was set to original music, which led to the masterwork of its kind, Bach's *Passion according to St. Matthew.*

Passive State. Condition of iron when immersed in concentrated nitric acid, probably due to the formation of a thin layer of protosesquioxide of iron. On this state depends the possibility of a zinc-iron battery.

Passover. Chief festival of the Israelites, commemorating the deliverance from Egypt, when God passed over their homes smiting the firstborn of the Egyptians; celebrated 14th of the month Nisan, first full moon after vernal equinox. For every household a paschal lamb was sacrificed, and eaten by the family accoutered as for hasty departure. No leaven could be found in any house throughout the week.

Passow, FRANZ LUDWIG KARL, 1786–1833. Prof. Breslau 1815; author of an important Greek lexicon, 1819–24, much drawn on by Liddell and Scott.

Passport. Document useful and often necessary in foreign travel; issued or signed by officers of government.

Pasta, GIUDITTA (NEGRI), 1798–1865. Italian singer, prominent in opera at Paris and London 1822–34.

Pasteboard. See CARDBOARD.

Pastel. Crayon for drawing on parchment or rough paper.

Pasteur, LOUIS, 1822–1895. Physician in Paris from 1857; Prof. of Chemistry at the Sorbonne 1867; famous for his treatment of hydrophobia by inoculation. *Memoire sur les corpuscules organisés qui existent dans l'atmosphère*, 1862; *Fermentation*, 1863; *Études sur la maladie des vers à soie*, 1870; *Les Microbes*, 1878. His Institute in Paris, opened 1888, has relieved patients from all parts of Europe, and been the model of similar establishments in America. Courses of lectures on the related subjects are also given here.

Pasteurized Milk. See STERILIZED MILK.

Paston Letters. 1,000 or more documents written by or to William Paston of Norfolk and his relatives 1422–1509; of historical value. Vols. I. and II. were pub. 1787, III. and IV. 1789, V. 1823; reprinted, 3 vols., 1872–75.

Pastoral Epistles. I. and II. Timothy, and Titus.

Pastoral Letter. Addressed by a pastor to his flock, by a bishop to his diocese, by the House of Bishops after General Convention, or by a synod to its congregations.

Pastoral Poetry. Begun among the Greeks by Theocritus in his idyls, it passed to Rome, as in Virgil's eclogues; was revived in Provence, and in Italy by Petrarch and Boccaccio, and later in dramatic form; was cultivated in Spain, France, England, and Germany; became a part of every national literature, and is now somewhat out of favor.

Pastoral Staff. Commonly called Crosier; curved and ornamented, borne by bishops, mitered abbots, and abbesses, one cross-bar denoting episcopal, two archiepiscopal, three patriarchal or papal rank.

Pastoral State. That stage in the progress of mankind in which cattle and other animals are domesticated and furnish the principal part of subsistence. It represents a decided advance on the hunter state, but is still far below the agricultural state.

Pastoral Theology. Branch of the seminary course, treating of parish work and the cure of souls.

Pastorals, or PASTORELLS. Disorderly mobs of would-be crusaders, who infested France 1251 and 1320.

Pastorius, FRANCIS DANIEL, 1651–1719. German Quaker, head of a company of emigrants 1683; founder of Germantown, Pa.; celebrated in Whittier's *Pennsylvania Pilgrim.*

Pastoral Staff.

Pasture. Land devoted to grasses or forage plants, upon which domestic animals are grazed.

Patagium. Fold of skin which stretches between the limbs on the sides of the body of bats and flying squirrels.

Patagonia. S. part of S. America; region of high mountains and desolate plains, inhabited by roving savages; recently appropriated and apportioned between Chili and Argentina, the former holding the portion west of the Andes and that bordering on the Strait of Magellan and the latter the portion east of the Andes. Araucanian nomadic tribes, living by fishing and hunting, numbering 4,000, inhabit w. P., and Patagonians, numbering ab. 7,000, e. P.

Patagonians (TEHUELT INDIANS). Noted for their physical development: the men average 6 ft., but the women are much shorter. They are powerful, brachycephalic, dark yellow, have long, coarse, abundant hair, Roman noses, and intelligent expression. They are cleanly, but paint and hang trinkets

Group of Patagonians.

in their ears: tatooing is practiced. They live by hunting from horseback, using the bolas; their houses are tents of skins. Honest among themselves, they steal from and deceive strangers. The wife is won by courtship. They worship the moon; the dead are buried in stone cairns in a sitting posture.

Patapsco River. In Md., flowing e. through Baltimore into Chesapeake Bay. Length 80 m.

Patay. Town of France, 13 m. n.w. of Orleans. Here the French under Dunois and Joan of Arc defeated the English under Talbot June 18, 1429.

Patch, ABBOTT LAWRENCE, b. 1861. American meteorologist.

Patch, SAMUEL, 1807–1829. American athlete, who leaped Niagara safely, and was killed at Genesee Falls, Rochester, N.Y.

Patches. Used by ladies ab.1600–1725 to set off their complexions.

Patchouli. Perfume derived from *Pogostemon patchouli*, a small shrubby plant, native of Penang and Malacca. In India it is used to scent tobacco and as a perfume for the hair. It is also used to keep insects from linen and woolen articles.

Patella. See KNEE.

Patellidæ. See CYCLOBRANCHIATA.

Patelliform. In Botany and Zoölogy, organs or organisms shaped like shallow saucers.

Paten. Round plate to hold the bread for Holy Communion.

Patent. Governmental grant to an inventor, securing to him the exclusive enjoyment of his invention. The subject is regulated by statutes. In the U.S., the national government has exclusive jurisdiction of patents. Each grant of patent is for 17 years; or, if previously granted in a foreign country, it expires simultaneously with the latter. The fee for filing is $15 and issuing $20. In 1895, 22,057 patents were granted; from 1831–96, 566,615 patents were issued by U.S.

Patent Hammer. So arranged that several stone chisels can be clamped together to form its head; used for dressing stone after the surface has been roughly formed by the common hammer.

Patent Medicines. Medical compounds for the sale of which the proposer obtains an exclusive privilege from the Government. His invention must be registered in the Patent Office, hence it differs from a secret and proprietary medicine.

Pater, JEAN BAPTISTE JOSEPH, 1695–1736. French painter, pupil and follower of Watteau.

Pater, WALTER HORATIO, 1839–1894. English author, noted for delicacy of thought and purity of style. *The Renaissance*, 1875; *Marius the Epicurean*, 1885; *Imaginary Portraits*, 1887; *Appreciations*, 1889; *Plato and Platonism*, 1893; *Gaston de Latour*, 1896.

Paterculus, VELLEIUS, ab.19 B.C.–ab.31. Roman courtier and historian; prætor 15. His book was first pub. 1520.

Patereros. Small pieces of ordnance worked on swivels. Used on board ship, mounted on the gunwale to throw nails, etc., into the enemy's ships.

Pater-noster. Lord's Prayer in Latin; used in nearly all liturgies.

Paterson. City of Passaic co., N. J., 14 m. n.w. of Jersey City; on Passaic River, which here falls 72 ft.; settled 1791, chartered 1850; noted for its manufactures of silk. Pop., 1890, 78,347.

Paterson, JOHN, 1744–1808. Col. of Mass. troops 1775; Brig.-gen. 1777, Major-gen. 1783; M.C. from N.Y. 1803–5.

Paterson, ROBERT, ab.1715–1801. Original of Scott's "Old Mortality."

Paterson, WILLIAM, 1658–1719. Scottish projector of the Bank of England, 1694, and of a colony at Darien, which failed disastrously 1698–69; M. P. 1708; free-trader and advanced financier.

Paterson, WILLIAM, LL.D., 1745–1806. U.S. Senator 1789–90; Gov. of N.J. 1791; Justice U.S. Supreme Court from 1793.

Pathogenic Bacteria. Those that produce disease. See DISEASE GERMS.

Pathology. Branch of medical science investigating the character of the changes of the tissue in disease and of the modifications of the function of any organ due to disease.

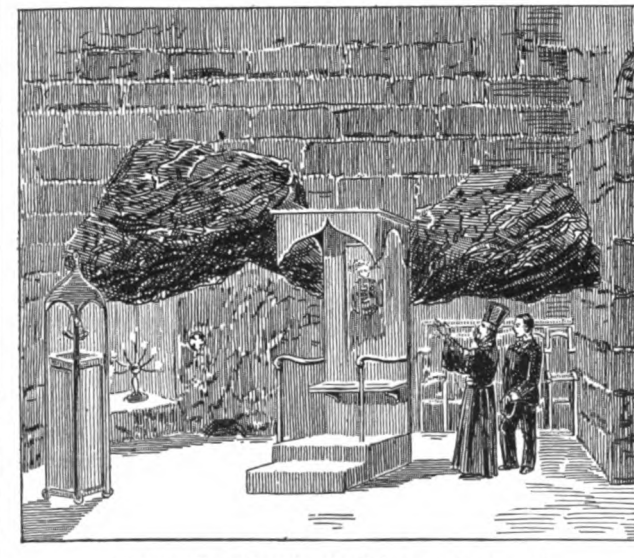
Pathology (MENTAL). See LUNACY.

Patience. The habit of mind which enables one calmly to endure afflictions or await what one wishes for.

Patkul, JOHANN REINHOLD VON, ab.1660–1707. Livonian negotiator of the alliance of Russia against Sweden; given up to Charles XII., tortured, and executed.

Patmore, COVENTRY KEARSEY DEIGHTON, 1823–1896. English poet. His *Angel in the House* includes *The Betrothal*, 1854, *The Espousals*, 1856, and two more parts, 1860–63. He ed. *The Children's Garland*, 1862.

Patmos. Island in the Ægean Sea, s. of Samos, to which St. John was banished, and where it is supposed he wrote the



Cave in which St. John the Divine was imprisoned.

Revelation. It is 28 m. in circumference, and is divided into n. and s. parts by a narrow isthmus. The population is entirely Greek and mostly sponge fishermen, numbering 4,000.

Patna. City of India, on s. bank of the Ganges, 140 m. e. of Benares. It has a Mohammedan college, considerable manufactures, and a large trade. Pop., 1891, 165.192.

Patois. Provincial dialect used by the illiterate.

Patok. Corean pebble game, corresponding with the Japanese game called So, and the Chinese game of Enclosing. The Corean board is peculiar in emitting a musical note when a piece is played.

Patolli. Game of the old Mexicans, played upon a cross-shaped diagram with pieces or men, according to the throws with certain objects, for which beans are said to have been

employed; practically identical with the Hindu Pachisi, and regarded by Prof. Tylor as evidence of the Asiatic origin of Mexican culture. The development of the game, which was originally cosmical and divinatory, may be traced in America, and there is no indication of its foreign origin. See GOOSE.

Paton, JOHN GIBSON, D.D., b. 1824. Scottish missionary to New Hebrides 1858-62 and since 1865. *Autobiography*, 1890.

Paton, SIR JOSEPH NOEL, LL.D., b. 1821. Scottish painter, chiefly of figures and historical scenes; knighted 1867.

Patras. Greek town, on the Gulf, 81 m. w. of Corinth; anciently Patræ; commercially important. Pop., 1890, 33,529.

Patria Potestas. Power of the *paterfamilias*, in Roman law, over all members of the family, slaves, children, wife. It included originally the power of life and death, the power to sell, and the right to all their acquisitions: this was much limited under the emperors.

Patriarch. Title of Abraham, Isaac, and Jacob; applied in N.T. to David, and in the Roman Empire to the Bishops of Rome, Constantinople, Alexandria, Antioch and Jerusalem; borne by some other modern bishops, as of Venice and Lisbon.

Patricians. At Rome, original free citizens, who long monopolized all rights of government and allowed no share therein to later settlers until forced to yield, after a century and a half of agitation, which several times threatened to destroy the state.

Patrick, ST., ab. 372-465. Apostle of Ireland, where his work began 432; b. in Scotland; taken in a raid ab. 388, and a slave till 395; said to have been ordained and consecrated ab. 417 in France. He belongs alike to history and to legend.

Order of St. Patrick.

Patrick, ST., ORDER OF. Instituted by George III. in 1783. It consists of 22 knights with the sovereign and the lord-lieutenant of Ireland.

Patrick, SIMON, D.D., 1626-1707. Bp. of Chichester 1689, and of Ely 1691. *Works*, 9 vols., 1858.

Patriotism. Love of one's country, especially as shown by sacrifices in its behalf.

Patripassians. Species of Monarchians in 2d and 3d centuries, who, for fear of dividing the Godhead, taught that the Father suffered in Christ.

Patristics. Branch of Historical Theology treating of the writings and influence of the Ch. Fathers.

Patroclus. Friend of Achilles, in command of whose troops he drove the Trojans back to their walls, but was slain

Achilles bandaging the wound of Patroclus.

by Hector. Achilles in revenge slew Hector and dragged his body behind his chariot.

Patronage. Power of appointing clergy to Ch. livings; partly allowed to founders or benefactors, in part incident to the feudal system; variously resident in popes, bishops, corporations, and laymen of wealth or station. Its survival in the English Ch. is often objected to: under the voluntary system it cannot exist. In U.S. politics, the nominations for government positions by members of Congress.

Patrons of Husbandry. See GRANGERS.

Patroon. Grantee in N.Y. or N. J. under the Dutch W. I. Co., exercising manorial privileges, with right of entail. He was to plant a colony of 50 in New Netherlands within 4 years of 1629.

Patten, SIMON NELSON, b. 1852. Prof. Univ. Pa. since 1885. *Premises of Political Economy*, 1885; *Consumption of Wealth*, 1889; *Stability of Prices*, 1889; *Principles of Taxation*, 1890; *Economic Basis of Protection*, 1891; *Theory of Dynamic Economics*, 1892.

Patterson, DANIEL TOD, U.S.N., 1786-1839. Distinguished at New Orleans 1814.—His son, CARLILE POLLOCK, U.S.N., 1816-1881, was connected with the Coast Survey from 1861, and its head from 1874.

Patterson, ROBERT, 1792-1881. Born in Ireland; served in war of 1812. Major-gen. U.S. Vols. 1846 and 1861, serving in Mexico and Va.

Patterson, THOMAS H., U.S.N., 1822-1889. Lieut. 1861, serving on the Atlantic coast; Commodore 1871, Admiral 1877.

Patteson, JOHN COLERIDGE, D.D., 1827-1871. Missionary in New Zealand 1855; Bp. of Melanesia 1861; killed by natives.

Patti, ADELINA (ADELEA JUANA MARIA), b. 1843. She sang in concerts as a child, but effected her operatic dêbut at the Academy of Music, New York, as *Lucia* 1859; went to Europe 1861, and did not return to America till 1881. In 1868 she was married to the Marquis de Caux, and in 1886 to the tenor NICOLINI.—Her sister, CARLOTTA, 1840-1889, devoted herself to the concert stage, and in 1879 was married to the violoncello virtuoso De Munck. They were of Italian parentage.

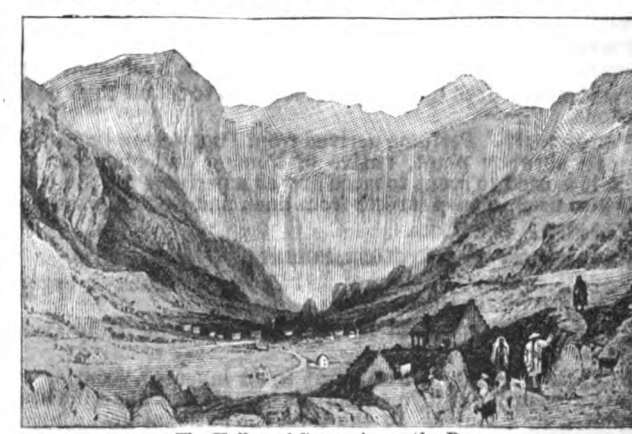
Pattison, MARK, 1813-1884. Rector of Lincoln Coll., Oxford, from 1861; contributor to *Essays and Reviews* 1860; biographer of Casaubon 1875, and Milton 1879. *Memoirs*, 1885.—His sister, DORA WYNDLOW, 1832-1878, joined an Anglican sisterhood 1864, and was eminent in philanthropic work.

Pattison, THOMAS, U.S.N., 1822-1891. Lieut. 1862; at Memphis, Tenn., 1863-65; Commodore 1877; Admiral 1883.

Patton, FRANCIS LANDEY, D.D., LL.D., b. 1843. Pres. Princeton Coll. 1889. *Inspiration*, 1869.

Patuxent River. In e. Md., flowing s.e. and entering Chesapeake Bay to the n. of the Potomac. Its oyster beds are very valuable.

Pau. Town of s. France, on the Gave de P., near the base



The Valley of Gavarnie, on the Pau.

of the Pyrenees; once capital of Bearn; birthplace of Henry IV. and Bernadotte. Pop., 1891, 32,111.

Paul, ST., ab.1-ab. 65. Originally Saul; Benjamite Jew, b. in Tarsus; Roman citizen; trained in Jerusalem, under the famous rabbi Gamaliel; violent persecutor, converted 36 into the most effective of the apostles; arrested ab. 58, confined in Jerusalem and Rome, and then beheaded. He stoutly opposed Jewish exclusiveness, opened the Church to the Gentiles, and by his epistles has supplied the main material for the development of Christian doctrine.

Paul, ST. VINCENT DE. See VINCENT DE PAUL.

Paul I. Pope 757-767.—II. PIETRO BARBO, 1418-1471, Pope 1464.—III. ALESSANDRO FARNESE, 1468-1549, Pope 1534. He made his grandsons cardinals, excommunicated Henry VIII. 1538, instituted the Society of Jesus 1540, strengthened the Inquisition 1542, and called the Council of Trent 1545 —IV. GIOVANNI

PIETRO CARAFFA, 1476–1559, Bp. of Chieti 1507, Abp. of Brindisi 1518, Cardinal 1536, Pope 1555. He founded the Theatines 1524, issued the first full Index librorum prohibitorum 1559, and was

a severe and not wholly successful ruler.—V. CAMILLO BORGHESE, 1552–1621, Cardinal 1596, Pope 1605. He had a long quarrel with Venice, founded several orders, and promoted foreign missions.

Paul, 1754–1801. Emperor of Russia 1796; son of Peter III. and Catharine II.; feeble and inconsistent; slain by conspirators, who meant to force his abdication.

Paul, HERMANN, b. 1846. Prof. Munich; one of the founders of the younger school of German philologists, ed. *Grundriss der germanischen Philologie. Principles of Language*, 1880.

Paul, HOWARD, b. 1835. American actor and playwright.

Paul, JEAN. See RICHTER, J. F.

Paula, ST., d. 404. Roman lady of great wealth and illustrious family, who, with her daughter Eustochium, was won by St. Jerome to the ascetic life in Palestine. Her day is Jan. 26.

Paulding, JAMES KIRKE, 1779–1860. American novelist; Sec. Navy 1837–41. *Salmagundi* (with Irving), 1807–19; *John Bull and Brother Jonathan*, 1812; *Dutchman's Fireside*, 1831; *Westward Ho*, 1832; *Life of Washington*, 1835.

Paulding, JOHN, 1758–1818. Captor, with I. Van Wart and D. Williams, of Major André, Sept. 23, 1780.—His son, HIRAM, U.S.N., 1797–1878, became Captain 1844 and Admiral 1862.

Pauli, GEORG REINHOLD, 1823–1882. Prof. Rostock 1857, Tübingen 1859, Marburg 1867, and Göttingen 1870. He wrote *King Alfred*, 1851, tr. 1852, and other books on English history.

Paulicians. Mediæval sect of Eastern dualists, who, in their dislike of Judaism, contended that St. Paul was the only genuine apostle; founded by Silvanus ab. 660; severely persecuted by Theodora ab. 850. Their doctrines survived, as among the Cathari.

Pauline Congregation. See PIARISTS.

Pauline Epistles. See ROMANS, CORINTHIANS, etc.

Paulinus, PONTIUS, 353–431. Bp. of Nola, s. Italy, 409; author of poems and letters.

Paulinus, d. 644. Roman missionary to Britain 601; bp. 625; titular Abp. of York 633.

Paulist Fathers. R.C. order established by Rev. Isaac Thomas Hecker in N.Y. 1858; devoted to church work in various forms.

Paul of Samosata. Bp. of Antioch ab. 260–272. He taught that the Godhead in Christ was rather a power than a person.

Paul Pry. Name given to an inquisitive and meddlesome fellow; from a comedy of that name by John Poole, 1825.

Paul's Cross. Originally of wood, on n. side of old St. Paul's, London; replaced ab. 1480 by a stone cross and pulpit which were removed by order of Parliament 1643. Sermons were preached, religious disputations held, and papal bulls promulgated here.

Dr. Bourne Preaching at Paul's Cross.

Paul's, ST. (CATHEDRAL). See ST. PAUL'S.

Paulsen, FRIEDRICH, b. 1846. Prof. Berlin 1878. *Ethik*, 1889; *Einleitung in die Philosophie*, 1892.

Paulus, HEINRICH EBERHARD GOTTLOB, 1761–1851. Prof. at Jena 1789, Würzburg 1803–8, and Heidelberg 1811; rationalistic commentator on the Psalms 1791, Isaiah 1793, and N.T. 1800–4. *Life of Jesus*, 1828; *Handbook of Gospels*, 3 vols., 1830–33. He denied the supernatural.

Paulus, JULIUS, 3d cent. Roman jurist, from whom the Pandects draw largely.

Paulus, LUCIUS ÆMILIUS, ab. 230–160 B.C. Proconsul in Spain ab. 185; Consul 181 and 168; conqueror of Macedonia 168 B.C.

Paulus Ægineta. Greek physician, probably of 7th century. His *De Re Medica* was repeatedly tr. and widely read.

Paulus Diaconus, ab. 720–ab. 800. Historian of the Lombards to 744; author or compiler also of a *Hist. Romana* and other works.

Paul Veronese. See VERONESE.

Pauncefote, SIR JULIAN, b. 1828. British Minister to the U. S. 1888; knighted 1874.

Paunch, or RUMEN. First and largest division of the ruminant stomach. It receives the vegetable food in bulky, half-chewed condition.

Pauperism. Dependence on public support, through poor-rates or otherwise, of those without means of support through their own industry or individual assistance.

Paupers. See IMMIGRATION and POOR LAWS.

Pauropoda. Order of *Myriapoda*, including only *Pauropus*, a white, minute, ten-jointed insect, with nine pairs of legs, eight of which are borne on four segments. The antennæ have only five joints, and there are no maxillipedes, as in the *Chilopoda*. Tracheæ are absent.

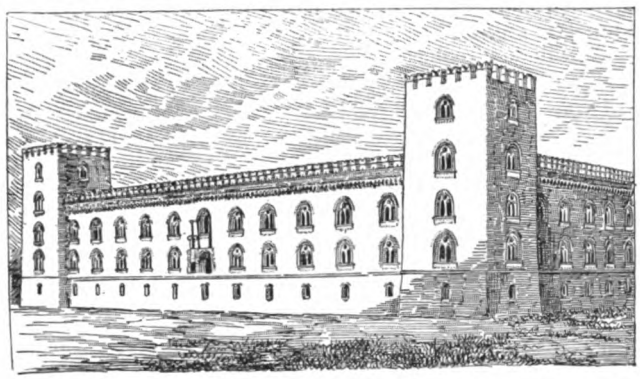
Pausanias, d. ab. 470 B.C. Spartan, nephew of Leonidas; commander of the allied Greeks at Platæa 479 B.C.; conqueror of Cyprus and Byzantium. Dazzled by success, he aimed at becoming tyrant of all Greece by aid of the Persian king, was proved guilty of treason and starved in a temple.—His grandson, PAUSANIAS, d. 385 B.C., was King of Sparta.

Pausanias, 2d cent. Greek writer, of w. Asia Minor. His *Itinerary of Greece*, tr. 1793 and 1886, is extensive, reliable, and of great value to the classical antiquarian.

Pauw, CORNELIS DE, 1739–1799. Dutch scholar, canon of Xanten. He wrote on the American Indians 1768, Chinese and Egyptians 1774, and Greeks 1788.

Pavement. Roadbed of loose stones compacted and rolled, or of cubical blocks set on a solid foundation. The Roman road pavements were made of polygonal blocks of basalt set on a very solid foundation of rubble and concrete. Broken stone pavements were first used in France ab. 1750, and soon after 1800 greatly developed in Great Britain by McAdam and Telford. Wooden pavements have been mainly used in the U. S., but have not proved successful. Brick pavements, introduced ab. 1870, are proving excellent for light traffic. In 1892 there were in 51 U. S. cities 2,402 m. of stone pavement, 736 of wood, 421 of asphalt, 88 of brick, and 1,446 of broken stone. Stone ranks highest for heavy traffic, and asphalt for light traffic in towns, while broken stone is the cheapest and best adapted to country roads. McAdam roads cost from 45 cts. to $1.70 per sq. yd.; brick $1.00 to $2.35; wood $1.15 to $2.65; Belgian blocks of trap rock $2.00 to $2.50; granite blocks $2.00 to $4.50; asphalt $2.65 to $4.60. This depends largely upon the foundation for the pavement.

Pavia. City of n. Italy, on the Ticino, 21 m. s. of Milan; the ancient Ticinum; Lombard capital 573; pillaged by the French 1500, 1527, and 1796. Francis I. of France was defeated



Visconti Palace at Pavia (restored).

and made prisoner under its walls 1524. It fell to Austria 1814, but became a part of Italy 1859. Its university, traditionally founded by Charlemagne and really organized 1361, has ab. 60 instructors and 1,100 students. Pop. ab. 37,000.

Paving Stone. Stone blocks for paving streets are of trap, granite, or sandstone, the first being the toughest, while the others are better for horses' hoofs. They are 6 or 8 in. in depth, laid in courses across the street, the joints being filled with asphalt or cement.

Pavlov, NICOLAI, 1803–1865. Russian essayist, novelist, and poet.

Pawl. See RATCHET.

Pawn. Lowest piece in chess, usually regarded as representing a foot-soldier, probably its original form. In Burmah effigies of soldiers with shields are still used. The pawn is generally called soldier, except in Siam, where it is called bia, cowrie shell, probably from cowries having been used for this piece.

Pawnbroker. One engaged in lending money on the security of personal property pledged to him. His business is generally regulated by statutes. Business of great antiquity. The three balls sign is from the armorial bearings of the Medicis.

Pawnees. Indians originally of the Platte River region. They are agriculturists, but the wife, who is purchased, is made to do all the work. There are now ab. 2,500 on reservations in Nebraska and Indian Territory. The Arickarees or Rees, and Wichitas, ab. 1,000, belong to the same stock. They are unfriendly toward the whites.

Pawtucket. City of Providence co., R. I., on Blackstone River, 4 m. from Providence. Cotton manufacturing, begun here 1790, is the paramount industry, for which there is abundant water power. Pop., 1890, 27,633.

Paxillæ. Spines with brush-like ends, produced upon some of the dermal plates of star-fishes.

Pax Romana. General order and tranquillity which under the Roman empire displaced the tumults and wars of preceding times.

Paxton, SIR JOSEPH, 1803–1865. English gardener and architect; designer of the Crystal Palace 1851; knighted 1852; M.P. 1854. *Magazine of Botany*, 1834–49; *Botanical Dictionary* (with John Lindley), 1840–68.

Pay OF U. S. ARMY. The allowances are quarters, and forage for horses used in the public service. The yearly pay is as follows: Major-general, $7,500; Brigadier-general, $5,500; Colonel, $3,500; Lieut.-colonel, $3,000; Major, $2,500; Captain (mounted), $2,000; Captain (not mounted), Regimental Adjutant, and Quartermaster, $1,800; First Lieutenant (mounted), $1,600; First Lieutenant (not mounted), and Second Lieutenant (mounted), $1,500; Second Lieutenant (not mounted), and Chaplain, $1,400. All officers, except the generals, receive 10 per cent increase of pay for every five years additional service, up to 40 per cent; except that the maximum pay of a colonel and lieut.-colonel does not exceed $4,500 and $4,000 respectively. The private soldier receives $13 per month during the first and second years, and $14, $15, and $16 for the third, fourth, and fifth years respectively of his first enlistment; afterward $1 extra per month for subsequent enlistments. The pay of the non-commissioned officers ranges from $15 per month to a corporal for the first year of his first enlistment to $34 per month to first sergeants of engineers, ordnance and signal corps for the same year. The highest pay per month for the first year of enlistment is $60 to the chief musician of artillery or cavalry. The enlisted men in addition to pay proper are lodged, clothed, and fed. Full pay is the total pay to which the officer or soldier is entitled by law; half pay is given when an officer is on leave beyond the time for which he may draw full pay.

Pay Department OF U. S. ARMY. Under the direction of the Secretary of War this has charge of the payment of the army, and comprises one Paymaster-general with the rank of Brigadier-general, two Colonels, three Lieutenant-colonels, and twenty-two Majors.

Payer, JEAN BAPTISTE, 1818–1860. Fellow of the Paris Institute. *Familles naturelles des plantes*, 1848; *Botanique cryptogamique*, 1850–68.

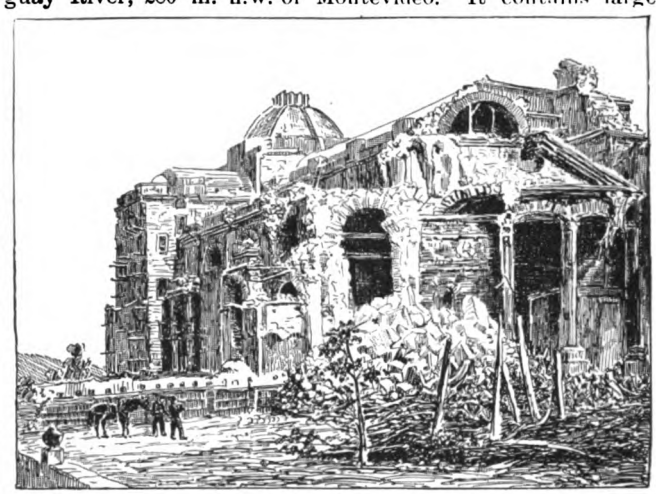
Payment. Money or its equivalent, received in discharge of an obligation.

Payn, JAMES, b. 1830. English novelist; ed. *Chambers' Journal*, 1858, and *Cornhill Mag.*, 1882–96. *Lost Sir Massingberd*, 1864; *Carlyon's Year*, 1868; *Literary Recollections*, 1884.

Payne, JOHN, b. 1842. English poet and translator.

Payne, JOHN HOWARD, 1792–1852. American poet, playwright, and actor; U.S. Consul at Tunis from 1841. The song, *Home, Sweet Home*, occurs in *Clari, or the Maid of Milan.*

Paysandu. City of Uruguay on the left bank of the Uruguay River, 280 m. n.w. of Montevideo. It contains large



Ruins of the Principal Church.

slaughter houses and exports tinned meats, especially tongues. It was visited by an earthquake 1865.

Payson, EDWARD, D.D., 1783–1827. Pastor at Portland, Me., from 1807. His *Sermons*, 1828–31, were widely read.

Pay Streak. Portion of a vein in which the richest ore occurs.

Pazmani, PETER, 1570–1637. Abp. of Presburg, Hungary, 1610. Cardinal 1629; eminent preacher, author, and persecutor of Protestants; founder Univ. Budapest, which is reprinting his works in 14 vols.

Paz Soldan, MARIANO FELIPE, 1821–1886. Peruvian statesman and historian.

Pea. *Pisum sativum.* Climbing herb of the natural family *Leguminosæ*, native of s. Europe; widely cultivated in many varieties for its nutritious seeds. Peas are not grown in field culture in the U. S., except occasionally with oats or barley as a meslin crop. The climate is too dry and hot for their best development. When grown with oats or barley, the resulting fodder makes an excellent food for milch cows.

Pea (*Pisum sativum*).

Pea, EVERLASTING, or VETCHLING. Plants of the genus *Lathyrus*, natural family *Leguminosæ*. Many of them bear showy flowers, and some are cultivated for ornament.

Peabody. Village of Essex co., Mass., 2 m. w. of Salem; called South Danvers till 1868; birthplace of George Peabody, who founded an institute and a library here. Pop., 1890, 10,158.

Peabody, ANDREW PRESTON, D.D., LL.D., 1811–1893. Prof. Harvard 1860–81; ed. *N. American Review* 1852–61. *Christian Doctrines*, 1844.

Peabody, ELIZABETH PALMER, 1800–1894. American educator, author, and reformer. Her sisters were the wives of Nathaniel Hawthorne and Horace Mann.

Peabody, GEORGE, 1795–1869. American merchant, in London from 1838; distinguished for his munificent philanthropy. He founded and endowed institutes at S. Danvers and Salem, Mass., and at Baltimore, Md., the last with $1,000,000; gave $150,000 each to Harvard and Yale, and smaller sums to other institutions; a fund of $3,500,000 to aid education in the South, and $2,500,000 to build lodging-houses for the London poor, besides numerous other donations.

George Peabody.

Peabody-Martini Rifle. Breech-loading rifle invented by Peabody, an American, and improved by Martini, a Swiss, and until recently the arm used by the English under the name of the Martini-Henry rifle. The breech block rotates around an axis at right angles to the bore and in rear of the block; used by the Turks during the Russo-Turkish war.

Peace. In International Law, the relation between states which are not at war; in Municipal Law, freedom from serious disorder among citizens of a state. The London Peace Society was founded 1816, and similar organizations have been established in other European states and in U. S. A Peace Congress was held in Paris 1889.

Peace-Offerings. Sacrifices of thanksgiving and supplication, including a sacrificial repast; whereas in the Burnt-offering the victim was entirely consumed.

Peace of God. Ab.1000 an effort was made by the clergy in France and Normandy to repress violence. To this end oaths were exacted by the bishops from rulers and subjects. The "Truce of God," first established perhaps by the Synod of Tuluges May 1027, ordained that warfare should cease from noon of Saturday till Monday morning. A later synod (1041) greatly extended this surcease of hostilities. During the Advent and Lenten seasons, *e.g.*, it was to last from Wednesday evening to Monday morning, and so on various festivals. Soon the custom spread over most of w. Europe. Special courts punished violations of the Peace by excommunication and exile for 7 or 30 years. The church, the wayside cross, and even the plow, insured protection. This Truce had great influence throughout Europe during the 12th century, but began to decline in the 13th.

Peace of the Dames. See CAMBRAY, PEACE OF.

Peace River. River of Athabasca, Canada, rising in Rocky Mts. and flowing ab. 600 m. e. and n.e. to the outlet of Lake Athabasca, where it joins (or becomes) the Slave.

Peach. *Amygdalus persica.* Small tree of the natural family *Rosaceæ*, native of China; widely cultivated in warm, temperate regions for its delicious fruit.

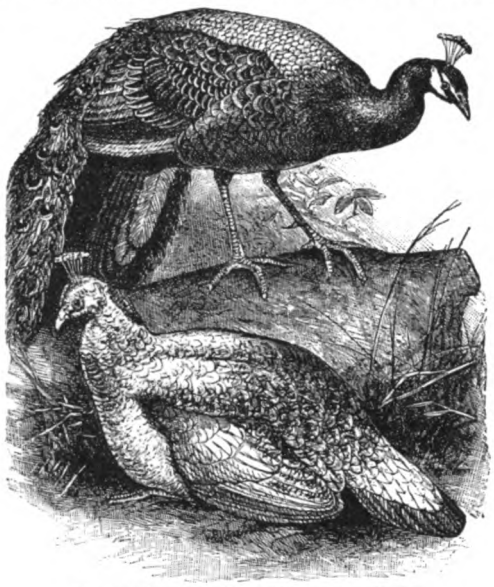
Peach, CHARLES W., 1800–1886. English geologist, first to discover fossil remains in the slate rocks of Cornwall, thereby establishing their Devonian age. He afterward labored successfully among the Devonian rocks of Scotland.

Peach Curl. Disease of peach leaves caused by the minute parasitic fungus, *Exoascus deformans.* Spraying with a 40 per cent of sulphate of iron solution will destroy the parasites.

Peach-Tree Borer (SANNINA EXITIOSA). The adult is bluish in color and resembles a small wasp. The eggs are deposited on the ground near the tree trunk. The young larva bores into the tree in early summer, and in a year has reached maturity. Whitewash containing Paris-green applied to the trunk of the tree removes it.

Peach Yellows. See YELLOWS.

Peacock. Male of genus *Pavo*, native of India and Ceylon, but domesticated all over the world. The wild Pea-fowl



Japanned or Black-shouldered Pea-fowls.

are gregarious, omnivorous, and prefer to live in mountainous regions. The gorgeous tail of the male is formed of the upper tail coverts, and is not fully formed until the third year.

Peacock, THOMAS LOVE, 1785–1866. English novelist and poet; clerk in India House 1819–56. *Headlong Hall*, 1816; *Melincourt*, 1817; *Nightmare Abbey*, 1818; *Maid Marian*, 1822; *Elphin*, 1829; *Crotchet Castle*, 1831; *Gryll Grange*, 1860. His works are short satirical extravaganzas. They were repub. 1875.

Peacock-Ore. See BORNITE.

Pea-Fowl. See PHASIANIDÆ and PEACOCK.

Peale, CHARLES WILLSON, 1741–1827. American painter, noted for portraits of Washington and other worthies.—His son, REMBRANDT, 1778–1860, N.A. 1826, was successful on the same lines, a good colorist, and author of several books. *Graphics*, 1841.

Peanut. *Arachis hypogæa.* Herb of the natural family *Leguminosæ*, native of America; widely cultivated for its nutritious, edible, subterranean fruit; also called Ground Nut, Earth Pea, and Goober. The kernels yield 20 per cent of non-drying oil, sp.gr. 0.918, used in dressing wool, as a lubricant, and for soap.

Peanut, HOG. *Falcata comosa.* Woodland vine of the Bean family, bearing edible tubers, native of e. N. America.

Pear. *Pyrus communis.* Tree of the natural family *Rosaceæ*, native of Europe; widely cultivated in many varieties for its delicious fruit. The liquor called Perry is fermented pear juice.

Pear, ALLIGATOR. See ALLIGATOR PEAR.

Pear, ANCHOVY. *Grias cauliflora.* Tall tree of the Myrtle family, native of the W. Indies, valued for its large fleshy fruit.

Pear, PRICKLY. Cacti of the genus *Opuntia*, and others, bearing prickly, edible fruits, natives of America. *O. puntio* is the common e. American species, known as Indian Fig.

Pearce, CHARLES SPRAGUE, b. 1851. American painter.

Pearce, JAMES ALFRED, 1805–1862. M.C. from Md. 1835–39, 1841–43; U.S. Senator from 1843.

Pea Ridge. In Benton co., Ark., scene of Union successes March 6–8, 1862.

Pearl. Sp. gr. 2.6. Rounded masses of calcium carbonate with some animal matter formed around some particle in some mollusks, the shells of which are lined with the same substance. The best pearls are found in the pearl oyster in the Indian seas; they are also obtained off the coast of Australia. Black pearls are found off Lower California. Pearls are round, oval, and pear-shaped, the former being most and the last the least prized. They are sold by the diamond-carat weight, 3.168 grains. A diamond-grain is $\frac{1}{4}$ of this. The best pearl, of a

diamond-grain weight, is worth $2.25. 4 gns. $34, 20 gns. $750; this is about proportional to the square of weight in diamond grains.

Pearlash. Potassium carbonate of commerce.

Pear-Leaf Blight. Yellowish or reddish spots upon pear leaves, marked in the center by minute black pimples. The disease is due to the fungus *Entomosporium maculatum.*

Pearl Fisheries. Practice of taking shellfish which produce pearls, especially the pearl oyster, in tropical countries. Originally only the pearl was sought for but now the shell is

Pearl Fishery in Ceylon.

also utilized, the shells being worth from 200 to 300 dollars a ton. In Ceylon the hours during which fishing may be carried on are regulated by law, the shellfish being obtained by diving.

Pearl Mussel. See AVICULIDÆ.

Pearl River. In Mississippi, flowing s.w. and s. to the Gulf of Mexico, and forming part of the La. boundary. Length ab. 250 m., drainage area 8,964 sq. m.

Pearl Spar. Variety of dolomite with a striking pearly luster.

Pearlstone. Feldspathic rock of volcanic origin, possessing a peculiar enamel-like appearance, due to an arrangement of its component minerals in small spherules.

Pearl White. See BISMUTH BASIC NITRATE.

Pearlwort. Diminutive herbs of the genus *Sagina*, family *Caryophyllaceæ*, of wide geographical distribution.

Pearson, JOHN, D.D., 1613–1686. Prof. Cambridge 1661; Bp. of Chester 1672; esteemed the greatest divine of his age. His *Exposition of the Creed*, 1659, is still used as a text-book. *Minor Works*, 1844.

Pear-Tree Borer (SESIA PYRI). Insect resembling the PEACH-TREE BORER (q.v.). The eggs are, however, deposited on the tree-trunk, and, after hatching, the small white larvæ eat into the sap-wood, causing wart-like swellings. Kerosene applied to these swellings kills the grub-like larvæ.

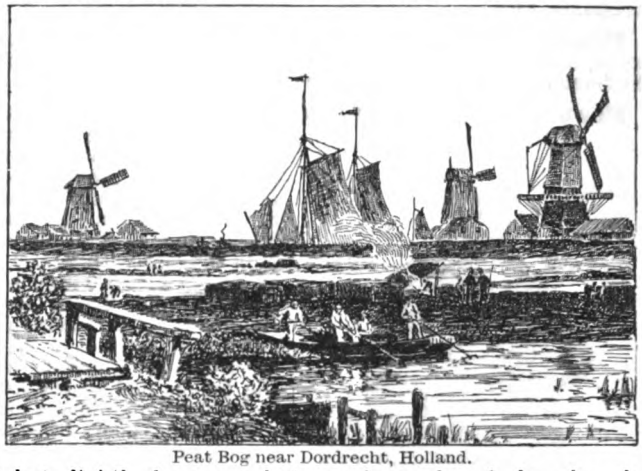
Peary, ROBERT EDWIN, U.S.N., b. 1854. Arctic explorer of the Greenland coasts June 1891–Sept. 1892, reaching lat. 82° N. on e. side. He sailed again July 1893 and July 1896.

Peasant Proprietorship. Ownership of agricultural land by its actual cultivators; system in which land is divided into small farms, and these are owned by their occupiers.

Peasants' War. Uprising of peasants in Germany 1525, influenced by the example of the Swiss and inflamed by the teachings of Luther and their own martial exploits in Italy. They committed the wildest excesses, plundered monasteries and castles, made Heilbronn the capital of their new empire, and were dispersed with great slaughter by the nobles. Thomas Münzer, a religious enthusiast, the soul of the uprising in Thuringia, set up his New Jerusalem in Mühlhausen. At Frankenhausen the peasants were overthrown by the princes May 25; 5,000 were slain: Münzer was executed.

Peaslee, EDMUND RANDOLPH, M.D., LL.D., 1814–1878. Prof. Dartmouth from 1842, and in New York; specialist in gynæcology. *Histology*, 1857; *Ovariotomy*, 1872.

Peat. Natural product of decomposition of vegetable matter that forms and accumulates slowly in bogs and marshes. It has a recognized value as a fuel and a fertilizer, and is finding increased use in the arts in several directions. It contains small and very variable amounts of nitrogen and phosphoric acid, but is chiefly valuable as adding vegetable matter to soils lacking it, and, when dry, as an absorbent of the liquid and volatile parts of animal manures. When the vegetable matter



Peat Bog near Dordrecht, Holland.

is but slightly decomposed, it may be used as fuel, as largely in Ireland.

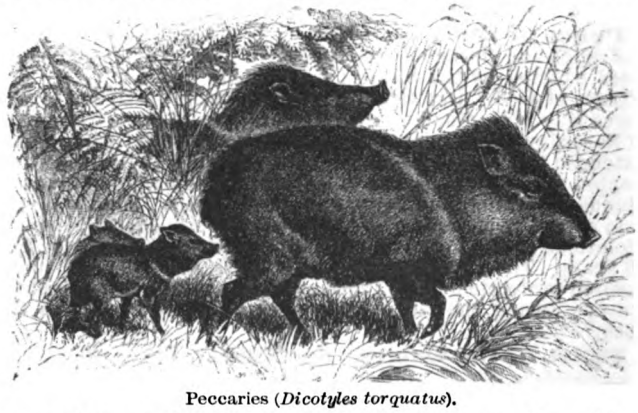
Pea-Weevil (BRUCHUS PISI). Beetle ⅛ in. long, black in color, with white T-like spots. Eggs are laid in the pod, and each larva enters a pea, in which it spends the winter. *B. obsoletus*, the bean-weevil, differs from this in that many grubs enter each bean. To destroy these insects the seed should be fumigated in a tight box with bisulphide of carbon, or else soaked a day in water before planting.

Pebble. Pieces of rock crystal used in jewelry or in the making of lenses for eye-glasses.

Pebble Powder. Large grained powder, generally cubical in form, first proposed by General Rodman ab.1860 for use in heavy guns, the object being to bring a less strain upon the gun during the first period of ignition than by the use of the quick-burning smaller grains; the size of the grains range from $\frac{1}{16}$ of an inch to 2 inch cubes.

Pecan-Nut. *Hicoria pecan.* Large tree of the Walnut family (*Juglandaceæ*), native of the s.e. U.S. Its nuts are collected in large quantities and form an important article of commerce.

Peccaries. S. American small wild pigs, differing from swine in having only one pair of teats and bearing at most two young. They have but four upper incisors: the stomach has three compartments. Metapodials III. and IV. unite into a



Peccaries (*Dicotyles torquatus*).

cannon bone, and the outer toe is reduced to a splint. They live in herds, and defend themselves ferociously. They secrete a very offensive odor, ravage cultivated fields, hide in thickets when pursued, and are best hunted from trees. Length 3 ft., height 16 in.

Pecchio, GIUSEPPE, COUNT, 1785–1835. Italian author, in England from 1823.

Pecchio, GIUSEPPE, 1785–1835. Italian writer on political economy.

Pechili, GULF OF. Arm of the Yellow Sea, extending into China.

Peck. In England and America, fourth of a bushel; in Eng., the Imperial, 554.55 cubic inches; in U.S., the Winchester, 537.6 cubic inches.

Peck, JOHN JAMES, 1821–1878. Brig.-gen. U.S. Vols. 1861, Major-gen. 1862; distinguished at Yorktown and Williamsburg; defender of Suffolk, Va., 1863.

Peck, TRACY, b. 1838. Prof. Cornell 1871, Yale 1880; ed. several Latin classics.

Peck, WILLIAM GUY, LL.D., 1820–1892. Prof. Columbia from 1857; author of text-books on mathematics.

Peckham, RUFUS WHEELER, 1809–1873. M.C. 1853–55; Judge N.Y. Supreme Court 1859–70, and Court of Appeals from 1870.—His son and namesake, b. 1835, became associate Justice U.S. Supreme Court 1895.

Pecock, REGINALD, D.D., ab.1390–ab.1460. Bp. of St. Asaph's 1444, and Chichester 1450. His theological writings, though in part against the Lollards, caused wrath by their moderation and by being in English: he was condemned as a heretic 1457, and confined in an abbey. *On Faith*, ab.1456.

Pecora, or COTYLOPHORA. Section of selenodont (Ruminant) Ungulates including the families MOSCHIDÆ, CAMELOPARDELLIDÆ, and CERVIDÆ (q.v.).

Pecos River. Branch of the Rio Grande, flowing s. and then s.e. through an arid region of New Mexico and Texas. Though ab. 800 m. long, it runs nearly dry through much of the year.

Pecquet, JEAN, ab.1600–1674. French anatomist, first to trace the course of the lacteal vessels in man.

Pectase. Ferment found with pectose in fruit tissues which transforms pectose into pectin in the process of ripening.

Pecten. Vascular process of the choroid, projecting through the retina into the hinder chamber of the eye in birds. See PROCESSUS FALCIFORMIS.

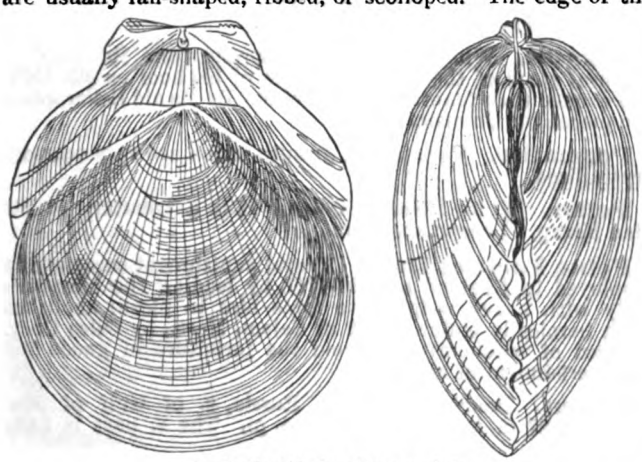
Pectic Acid. $C_{16}H_{22}O_{15}$?. Insoluble gelatinous substance produced by boiling an aqueous extract of carrots with sodium carbonate and precipitating with hydrochloric acid.

Pectin, or PLANT JELLY. $C_{32}H_{48}O_{32}$?. Substance present in fruits, etc., which causes their juice upon evaporation to form a jelly; soluble in water, but insoluble in alcohol, and precipitated from water by its addition; little known.

Pectinate. In Botany and Zoölogy, organs with numerous narrow segments, resembling the teeth of a comb.

Pectines. Comb-like organs born by the second abdominal segment in scorpions.

Pectinidæ (SCOLLOPS). Lamellibranchs without a siphon, with nearly equal symmetrical valves to the shell and a straight hinge line. The valves are united by one adductor muscle and are usually fan-shaped, ribbed, or scolloped. The edge of the



Pectinidæ (*Pecten pleuronectes*).

free mantle-lobes bears many tentacles and eyes. The foot secretes a byssus for attachment of some species; others swim about by rapidly opening and closing the shell. Some are edible, and are even more esteemed than oysters.

Pectinobranchiata. See PROSOBRANCHIATA and CTENOBRANCHIATA.

Pectoral Fins. See FINS.

Pectoral Girdle. See SHOULDER-GIRDLE.

Pectoriloquy. Speech or voice coming from the chest. Phenomenon presented by consumptive individuals when their chests are examined with the stethoscope. It does not always indicate a cavity in the lung, as a portion of the lung may have solidified and produce the same noise.

Pectose. Substance found in unripe fruits and other vegetable organs.

Pectosic Acid. Gelatinous product produced by the action of pectase upon pectose. Its composition is unknown.

Peculiar. In England, chapels royal, Westminster Abbey, and others not subject to episcopal jurisdiction.

Peculiar People. English sect, founded 1838; faith-healers, except in surgical cases.

Pedagogics. The science of education, including the subjects to be taught, the arrangements of these subjects, and the methods to be employed.

Pedal. In the organ, keyboard played upon with the feet; also mechanical contrivances (combination pedal) for drawing a group of stops by foot pressure; on the pianoforte, a lever for the foot for lifting all the dampers off the strings at once, shifting the action so that the blow is given to only one or two of the unison strings, or the force of the blow is lessened (piano or soft piano), or prolonging the sound of a desired tone or group of tones, by preventing the fall of the dampers (sustaining or sostenuto pedal); on the harp, a lever for raising the pitch of the strings.

Pedal Ganglion. Nerve centers (brains) in the foot of Mollusks. They form part of a short circumœsophageal system, which in the cerebral ganglia is united with another longer visceral system composed of the pleural, abdominal, and parieto-splanchnic ganglia.

Pedalinaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 15 genera and ab. 40 species, natives of the warm regions of the earth; especially numerous in Africa.

Pedal Point. See ORGAN POINT.

Pedata. Holothurians with many ambulacral feet, either in regular zones or irregularly distributed. They are fusiform and somewhat flattened on the side on which they lie. Respiratory trees are present. The oral tentacles are arborescent in the group DENDROCHIROTÆ, and shield-like in the ASPIDOCHIROTÆ (q.v.).

Pedate. In Botany, leaves and other flat organs palmately parted into narrow segments.

Pedder, JAMES, 1775–1859. Ed. Boston *Cultivator* from 1844. *Farmer's Land Measure*, 1854.

Pedersen, KRISTIERN, 1480–1554. Danish author and reformer, canon at Lund. Tr. N. T. and Psalms 1529–31.

Pedes. Feet of birds, distinguished as P. gradarii and P. vadantes. Of the former we have P. adhamantes, scansorii, fissi, ambulatorii, gresorii, insidentes. Of the latter are P. grallarii, divided into colligati, semicolligati, cursorii, palmati, semipalmati, fissipalmati, lobati, stegani. See each of these.

Pedesis, or BROWNIAN MOVEMENT. Dancing motion of very small particles, suspended in a liquid, as seen under high magnification. No satisfactory explanation of this movement has yet been given; but it appears probable that the vibrating molecules surrounding the body do not bombard it with equal force on all sides at any given instant; hence the particle is jostled in different directions.

Pedestal. An erection for the support of a statue, vase, or other ornamental object.

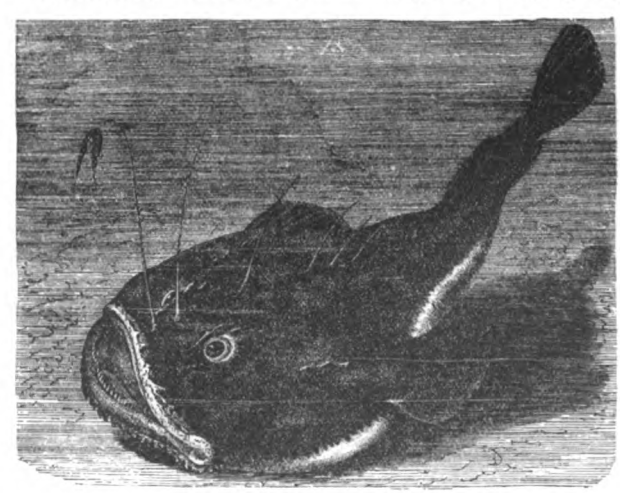
Pediastreæ. Sub-order of minute fresh-water *Algæ*.

Pedicel. Stalk of a flower in a flower-cluster.

Pedicellariæ. Little snapping jaws set on stalks on the surface of starfishes and sea urchins.

Pedicellina. See ENDOPROCTA.

Pediculati. Sub-order of *Acanthopteri*, including scale-

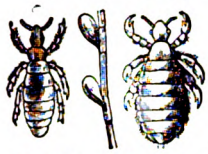


Fishing Frog (*Lophius piscatorius*).

less fishes having elongated rays, less than four in the pectoral fins, gill openings that are mere foramina behind these fins,

first dorsal spine modified, and with very odd shape of body. LOPHIUS (q.v.), the Fishing Frog, is an example.

Pediculidæ (LICE). Insects of the group *Aptera*, order *Rhynchota*. *Pediculus capitis* is the head-louse of man. It sucks blood, has hooked joints on its feet, and lays its eggs on the bases of the hairs. The young undergo no metamorphosis, and are sexually mature in eighteen days after hatching, which occurs a week after the eggs are laid. Numerous eggs are produced in a short time by each female: in the case of the body louse, *P. vestimenti*, ab. 5,000 in eight weeks.



Pedimana. See ENTOMOPHAGA.

Pediment. Gable of classic architecture, or the triangle formed by the cornice of the entablature and that which denotes the outline of the roof. It is always of low pitch and in the classic temples was a principal field for the display of sculpture.

Pedipalp (MAXILLARY PALP). Clawed CHELICERÆ (q.v.) of Arachnids, or more especially of the Scorpion-spiders.

Pedipalpi, or PHRYNIDEA (SCORPION-SPIDERS). Large *Arachnida*, with jaws provided with claws; the anterior pair of legs are slender and antennæ-like. The abdomen has eleven or twelve segments; unlike the scorpions, but like the spiders, it is clearly marked off from the thorax. The term, in a broader sense, includes the Scorpions.

Pedometer. Instrument which, when carried by a pedestrian, counts his steps, and thus enables him to determine approximately the distance traveled. See ODOMETER.

Pedrarias Davila, ab.1460–1531. Gov. of Castilla del Oro (Darien) 1514–26, and then of Nicaragua. He imprisoned Balboa 1514, put him to death 1517, and founded Panama 1519.

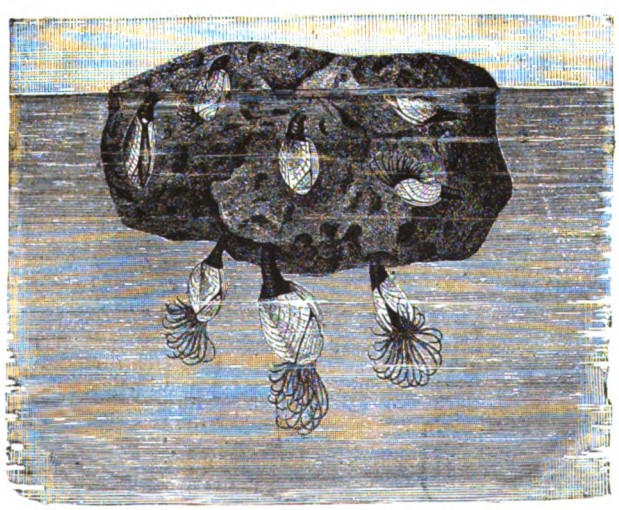
Pedro, "THE CRUEL." 1334–1369. King of Castile and Leon 1350; defeated and slain by his brother Henry.

Pedro I., 1798–1834. Son of John VI. of Portugal, who became king 1816; in Brazil from 1807; Regent 1821; Emperor 1822, independence being secured. He inherited the throne of Portugal 1826, resigned it to his daughter Maria, abdicated 1831, went to England, and procured the deposition of the usurper Miguel and Maria's restoration.—His son, PEDRO II., 1825–1891, Emperor 1831–1889, was a good ruler, much respected everywhere for his character and enlightened views, but was deposed on the proclamation of the Republic. He traveled much in Europe, and visited the U.S. 1876. Slavery was gradually abolished in Brazil 1871–88.

Pedro Sancho, or SANCHO PEDRO. Game like All Fours, in which the five of trumps, called Pedro, counts 5 points, and the nine of trumps, called Sancho, 9 points.

Peduncle. Stalk, either of a single flower or of a flower-cluster.

Pedunculata. Group of Barnacles, characterized by the presence of a stalk by which the animal is fixed; six pairs of



Goose-barnacle (*Lepas anatifera*).

feathery feet; a mantle in which hard plates are developed, viz., a carina, a pair of scuta, a pair of terga. *Lepas* (Goose-barnacle) is an example.

Peel, SIR ROBERT. 1788–1850. M.P. 1809; Sec. for Ireland 1812–18; Home Sec. 1822–27 and 1828–30; leader of the Commons; mover of Catholic emancipation 1829; Prime Minister 1834–35 and 1841–46. Mainly a Conservative, he accepted the repeal of the Corn Laws, and at last was more Whig than Tory.—Of his sons, SIR ROBERT, 1822–1895, M.P. 1850, was Sec. for Ireland 1861–65; ARTHUR WELLESLEY, b. 1829, became M.P. 1865 and Speaker 1884.

Peele, GEORGE, ab.1558–ab.1598. English poet and dramatist. *Arraignment of Paris*, 1584; *Old Wives' Tale*, 1595; *David and Bethsabe*, 1599.

Peeping Tom. Character in the Godiva story, represented as a tailor who thought to have a peep at Lady Godiva, and was punished by the loss of an eye. See GODIVA.

Peep-of-Day Boys. Irish insurgents of 1784, later known as ORANGEMEN (q.v.).

Peepul. *Ficus religiosa*. Sacred fig of India, and Bo-tree of Ceylon. Vishnu is supposed to have been born beneath it.

Peerlkamp, PETER HOFMAN, 1786–1865. Prof. Leyden 1822–49; classical rationalist, who applied a destructive criticism to Horace, Virgil, and Tacitus.

Peers. British dukes, marquises, earls, viscounts, and barons, having (with the bishops or lords spiritual) seats in the House of Lords. The French House of Peers, 1814–48, was arbitrarily constructed.

Peesash. Hot, dry land wind in n. India, like the sirocco, and possibly of a föhn-like character.

Peet, STEPHEN DENISON, b. 1830. Ed. *American Antiquarian*, 1879–88. *Picture Writing*, 1885; *Primitive Symbolism*, 1887.

Peewet (LAPWING). European plover.

Peewit (PEEWEE, etc.). Phœbe; olive-green Tyrant fly-catcher.

Peganthidæ. Family of *Narcomedusæ*, including Jelly-fishes, without radial canals or stomach-pouches in the sub-umbrella, but with a ring-canal which is festooned with separated pouches. The tentacles project up, and OTOPORPS (q.v.) are at the bases of auricular tentacles.

Pegasus. Winged horse which sprang from the blood of Medusa; steed of the Muses. A blow of his hoof on Mt. Helicon evoked their fountain, Hippocrēnē. By his aid Bellerophon conquered the Chimæra.

Pegmatite. Varieties of granite which are very coarsely crystallized.

Peiho. White River of China. It is a tributary of the Han Kiang. Length ab. 124 m.

Peine Forte et Dure. Brutal punishment occasionally employed in England ab.1400–1741, by loading the offender's body with heavy weights, to force him to plead; abolished 1772; heroically endured 1692 at Salem, Mass., by Giles Cory, accused of witchcraft, to avoid the forfeiture of goods and impoverishment of his family.

Peipus. Double lake of w. Russia, s. of Gulf of Finland, ab. 87 m. long; area 1,356 sq. m. The s. part is Lake Pskoff.

Peirce, BENJAMIN, LL.D., 1809–1880. Prof. Harvard from 1833; Supt. U. S. Coast Survey 1867–74; of high authority as astronomer and mathematician; author of sundry influential text-books. *Analytic Mechanics*, 1855.

Peirce, BRADFORD KINNEY, 1819–1889. Ed. *Zion's Herald* (Boston), 1872–88; religious and biographical writer.

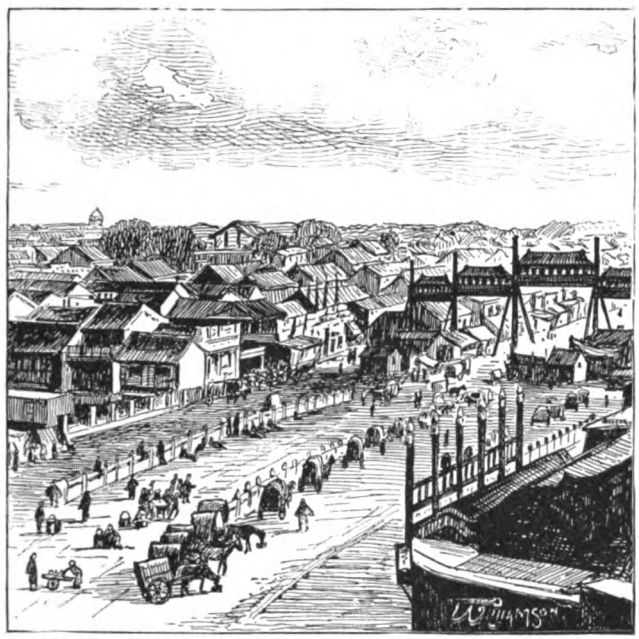
Peirce, CYRUS, 1790–1860. Promoter of Normal Schools; head of the first opened in U. S., at Lexington, Mass., 1839–42 and 1844–49.

Peixoto, FLORIANO, 1839–1895. Brazilian general; Vice-pres. 1890, Pres. 1891–94. He crushed a dangerous rebellion 1893–94, which had threatened Rio Janeiro.

Peixoto, IGNACIO JOSÉ DE ALVARENGA, 1748–1793. Brazilian poet, condemned 1792 for insurrection.

Peking, or PEKIN. Capital of China; 100 m. from the sea and 120 ft. above sea-level; area inclosed 24½ sq. m. It consists of a Tartar and a Chinese section; the imperial palaces are in the former, the Temple of Heaven in the latter. It was

rebuilt by Kublai Khan 1265, visited soon after by Marco Polo, and has been sole capital of the empire since it was restored



The High Street, Peking.

and walled 1409–37. The English and French forces entered it 1860. Pop. ab. 500,000.

Pela, or PEHLA. White wax prepared by the Chinese from the secretions of *Coccus sinensis*, an insect of the cochineal family. It resembles spermaceti and is used in candle making. It melts at ab. 81° C.

Pelagia. See SEMÆOSTOMEÆ.

Pelagianism. Doctrine supposed to deny original sin and divine grace, as teaching that men sin merely by imitation, and may reform of their own will; condemned by the Church, led by Augustine.

Pelagic. In Botany and Zoölogy, organisms inhabiting the deep seas.

Pelagic Zone. See BATHYMETRIC DISTRIBUTION.

Pelagius. British heresiarch, in Rome ab. 400; perhaps a monk, but never ordained; banished 418. His doctrine was urged by Cœlestius, and condemned 431.

Pelagius I. Pope 555–60.—II. Pope 578–90.

Pelargomorphæ. Order of birds equivalent to a part of the *Grallatores*, including Herons and Storks. See HERODII.

Pelargonic Acid. $C_9H_{18}O_2$. Mpt. 12.5° C., bpt. 253° C. Colorless, oily liquid which turns yellow by age, occurring naturally in oil of rose-geranium. It is made by heating oil of rue with nitric acid.

Pelargonic Ether. Bpt. 216°–219° C. Ethyl ether of pelargonic acid. It gives the odor to the quince.

Pelasgi. Race, prob. Aryan, apparently first to occupy the coasts of Greece, islands of the Ægean, and s. Italy. The oldest architectural remains of Greece are ascribed to them.

Pelayo, 8th cent. Traditional Spanish king or chief, in conflict with the Moors.

Pelecypoda. See LAMELLIBRANCHIATA.

Pele's-Hair. Form of cirrus cloud.

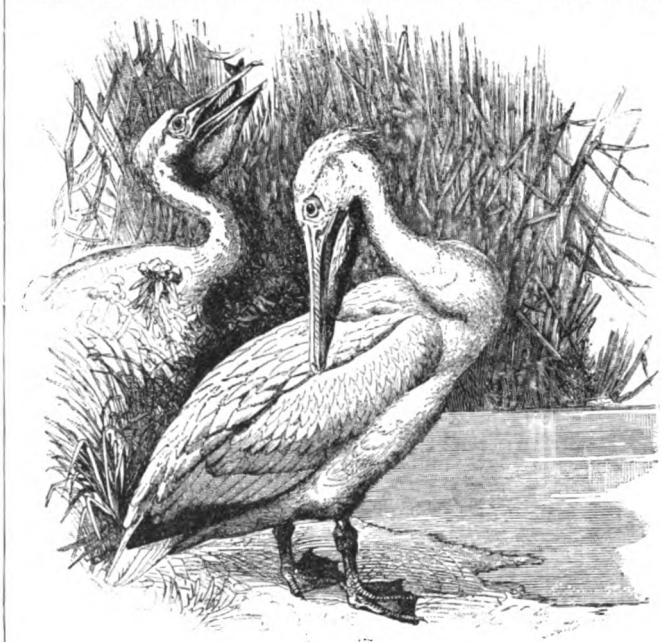
Pele's Hair. Variety of glassy lava from the Hawaiian Islands, spun by wind action into fine threads.

Peleus. King of Phthia, Thessaly; argonaut; husband of Thetis and father of Achilles.

Pelew Islands. Group in the Pacific, s.e. of the Philippines; discovered 1543; held by Spain. Area 170 sq. m., pop. ab. 10,000.

Pelham, HENRY, 1696–1754. Brother of the Duke of Newcastle; Sec. for War 1724; Prime Minister from 1743.

Pelicans. Twelve species of tropical and subtropical steganopodous birds, having a tail of 24 soft feathers, and a long bill, beneath the mandible of which is a distensible pouch



Pelican (*Pelecanus onocrotalus*).

for carrying fish. The Pelican of N. America goes north into temperate regions in summer, and at its breeding time (May) a deciduous excrescence develops on top of the beak.

Pelides. Achilles, as son of Peleus.

Peligot's Salt. $KClCrO_5$. Formed by the action of concentrated hydrochloric acid upon potassium dichromate; red prismatic crystals.

Pelion. Range in e. Thessaly. See OSSA.

Pelissier, JEAN JACQUES AMABLE, 1794–1864. French general 1850; commander in the Crimea 1855; made Marshal and Duke of Malakoff for storming a fort near Sebastopol; Ambassador to England 1858–59; Gov. of Algeria from 1860.

Pella. Macedonian capital, ab. 15 m. n.w. of the Thermaic Gulf; birthplace of Philip II. and Alexander; important in their times, but it disappeared before 600 A.D.

Pellegrini, CARLO, 1838–1889. Italian cartoonist, in London from 1868.

Pellew, GEORGE, 1861–1892. Anglo-American journalist and author. *Castle and Cabin*, 1888; *Life of Chief-justice Jay*, his great-grandfather, 1890.

Pellico, SILVIO, 1789–1854. Italian patriot, author of tragedies and of *My Prisons*, 1833; imprisoned by Austria for alleged political offenses 1820–30; sentenced to death 1822.

Pellitory. Herbs of the genus *Parietaria*, of the Nettle family, natives of the n. hemisphere.

Pellitory (*Parietaria officinalis*).

Pelly River. Right branch of the Yukon, in British Columbia.

Pelmatozoa. Group of Echinoderms, including stalked and mostly fossil forms, of the classes CRINOIDEA, CYSTIDIA, and BLASTOIDEA (q.v.).

Pelobatidæ. Family of Toads, including *Scaphiopus*, the Spade-foots. These live underground, burrowing to a considerable distance. They appear in June during rains, to lay their eggs in temporary pools. They are very noisy. Most of the stories of finding toads in the midst of rocks during blasting operations are probably based on finding them either in hard soil or in rock clefts. See OXYDACTYLIA.

Pelopidas, d. 364 B.C. Theban patriot, associate of Epaminondas. Banished 382, he overthrew the Spartan power and expelled the polemarchs from Thebes 379; led the Sacred Band at Leuctra 371; was Ambassador to Susa 366, and was killed at Cynocephalæ.

Peloponnesian War. 431–404 B.C.; between Athens and the s. Greek states, supported by their colonies. The destruction of the Athenian fleet and army at Syracuse 413 was fatal; and the war ended most unfortunately for civilization with the capture of Athens by the Spartans 404. Its history was brilliantly written by Thucydides.

Peloponnesus. Peninsula of Greece; now Morea.

Pelops. Son of Tantalus; king of Elis; father of Atreus and Thyestes; honored above all heroes at Olympia.

Peloria. Condition of monstrosity, especially in certain plants of the Snapdragon family, in which, instead of only one lobe of the corolla being extended into a spur, as is the normal state, the other four lobes are also spurred; also, more broadly, regular forms of flowers which are normally irregular.

Pels, ANDRIES, 17th cent. Dutch dramatist and poet.

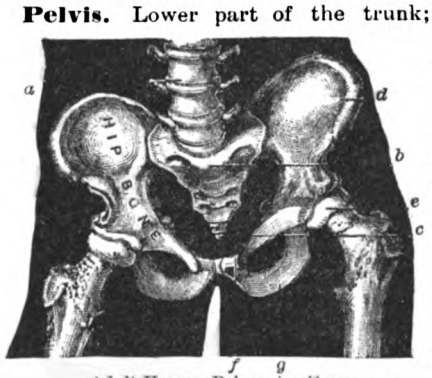
Peltate. In Botany, leaves or other organs having the stalk inserted on the lower surface of the lamina, instead of at the base, so as to become shield-shaped.

Peltier's Effect. Thermo-electric phenomenon, first observed by Peltier. Consider a junction of two metals, A and B, such that, when this is made the hot junction in a thermo-electric circuit, the current is from A to B. If now a current from some external source be made to pass through that junction from A to B, the junction will be cooled; while if the direction be from B to A, it will be heated. A similar phenomenon was observed by Thomson to take place within a single metal, and in this case is known as the Thomson effect. *E.g.*, hot iron is thermo-electrically positive to colder iron, and hence a current made to pass in either direction tends to exaggerate the existing differences of temperature. This is reversed in the case of copper.

Peltry. Skins of wild animals undressed except by drying; dressed skins being called furs.

Pelusium. City on e. mouth of the Nile; key of Egypt. Here Cambyses defeated Psammetichus III. 525 B.C. It surrendered to Alexander 333, was taken by Persians 309, by Antiochus 173, by Mark Antony 55, by Octavian 31 B.C., and by the Saracens A.D. 638.

Pelvis. Lower part of the trunk; a basin-like cavity formed by the union of the innominate bones with the lower end of the spinal column. It furnishes a foundation for the contents of the abdominal cavity and attachments for the muscles forming the abdominal walls.



Adult Human Pelvis, *in situ;*
a, lumbar vertebra; *b*, sacrum; *c*, coccyx; *d*, ilium; *e*, head of femur in acetabulum; *f*, pubis; *g*, ischium.

Pemba. Coral island 30 m. n. of Zanzibar, belonging to the British protectorate of Zanzibar. It produces excellent timber. Area 227 sq. m., pop. ab. 10,000.

Pemberton, JOHN CLIFFORD, 1814–1881. U. S. officer 1837–61; Brig.-gen. C.S.A. 1861, Lieut.-gen. 1862–63; defender of Vicksburg against Grant May-July 1863.

Pemberton, MAX, b. ab. 1860. English romancer; ed. *Cassell's Mag.* 1896. *A Puritan's Wife*, 1896; *Stories of Old Paris*, 1897.

Pemmican. 1. Dried venison or buffalo meat, used by Indians. 2. Preparation of beef for Arctic expeditions.

Pemphigus. Inflammatory disease of the skin marked by blisters from the size of a pea and upward, forming successive crops. The blisters may break and form scabs and leave a dark spot, rarely a scar, when healed. The disease is sometimes fatal, especially when of long duration.

Pen. Writing instruments of two general kinds, those which scratch and those which use ink. The former are the more ancient and consist of a stylus made of bone or metal and employed upon a leaf, a waxed tablet, a sheet of lead, a stone, etc. The pen with which ink was applied was made 40 centuries since of a reed, which continued until ab. 500, when the quill came into use. The pen was used to write on bark, leaves, papyrus, skins, and paper. Modern pens are made entirely of metals. A bronze nibbed pen was found at Pompeii. The steel pens are made by a succession of stamps and dies and carefully tempered. Birmingham, Eng., is a large manufacturer; U. S. has several factories, producing one and a half million gross, and imports half a million gross.

Penæaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 4 genera and ab. 20 species, natives of s. Africa.

Penal Colonies. England sent convicts to Virginia 1619–1770, when the colonists refused to receive them longer; subsequently Botany Bay, Sydney, Tasmania, North and West Australia, and British Guiana were utilized in a similar way till about the middle of the 19th century. Russia sends the majority of her criminals to the mines in Siberia. France sent convicts to French Guiana 1853–64 and Communists to New Caledonia 1871. Other European states have gotten rid of many of their convicts by transportation.

Penal Servitude. Punishment introduced in lieu of transportation beyond the seas. See PRISONS.

Penalty. Punishment imposed either by law or by contract; excessive penalties are forbidden by U. S. Constitution.

Penance. Self-mortification of any kind, inflicted as expiation of sin; in R. C. Ch., a sacrament. In the Middle Ages penances were various, heavy, and constantly in evidence.

Penances, or FORFEITS. Children's game. Penances are properly the sequence of forfeits. The players are required to perform certain feats, and failing, give forfeits. These are later redeemed, one player acting as judge and one as forfeit-crier, who stands behind the judge and holds up the forfeit. The judge, without seeing the forfeit, passes sentence, to which the owner of the article must submit in order to redeem his property.

Penang, or PRINCE OF WALES ISLAND. W. of Malay peninsula, at n. end of Strait of Malacca; held by Britain since 1785. It is covered with forests of palms and other tropical

Penang.

plants. It produces rice and sugar. Tin ore is also found. Georgetown or P. is the only town. It is situated on the strait which divides the island from the mainland. Area 107 sq. m., pop. ab. 100,000.

Penātes. Guardian deities of the Roman household, and of the state as a union of households. Their images were kept in the penetralia, or central part of the house; the fire on the hearth was sacred to them. See LARES.

Peña y Peña, MANUEL DE LA, 1789–1850. Member of Mexican Supreme Court 1824, and long its head; acting Pres. of Mexico 1847–48.

Pencil. Collection of rays, either of radiant energy or other form of wave motion. It may be convergent or divergent.

Pencil. Plumbago inclosed in a small wooden cylinder, used as early as 1565. The plumbago is mixed with clay and water to form a dough, pressed through perforations in a metal cylinder, dried and baked. The rods thus formed are then incased in cedar. Colored pencils are made by mixing pigments or aniline colors with clay: 250 million pencils are made annually at Nuremberg, Germ., Faber being a noted maker. There are large makers in U. S.

Pencil, AXIAL. Figure composed of planes, all embracing the same straight line, which is the axis of the pencil.

Pencil, FLAT. Figure formed by straight lines in the same plane, proceeding from a common point.

Penda. King of Mercia, England, 626–655; and champion of heathenism. He subdued East Anglia, Deira, and Wessex, defeated and killed Edwine of Northumbria 634, and was Bretwalda. The extinction of heathenism followed his death; slain by Oswes.

Pend d'Oreille, LAKE. In n. Idaho, on Clark's Fork of the Columbia. Area 130 sq. m.

Pendent. In Gothic Architecture, the keystone of a vault when projected from the ceiling and decorated; also applied to the protrusion of the hammer-beam in timber construction.

Pendentine. Curved and inward sloping spandrel between two arches which support a circular or polygonal dome. It is a feature of frequent occurrence in the Byzantine, Saracenic, and Renaissance styles; in fact, a necessary feature in all architecture which admits a classical construction.

Pendent-Post. In timber roofs, the straight pieces placed against the wall to receive the hammer-beams.

Pender, WILLIAM DORSEY, 1834–1863. Major-gen. C.S.A. 1863; mortally wounded at Gettysburg.

Pendergrast, GARRETT JESSE, U.S.N., 1802–1862. Captain 1855, Commodore 1862. He commanded the *Cumberland* off Norfolk 1861, and saved the U.S. vessels there from capture by threatening the city.

Pendleton, EDMUND, 1721–1803. Delegate to Congress 1774–75: Pres. Va. Chancery Court 1778 and Court of Appeals from 1779.—His nephew, NATHANIEL, 1756–1821, was a Judge in Ga. and N.Y.—His grandson, GEORGE HUNT, 1825–1889, was M.C. from Ohio 1857–65, Democratic candidate for Vice-Pres. 1864, U.S. Senator 1879–85, and U.S. Minister to Germany 1885.

Pendleton, LOUIS BEAUREGARD, b. 1861. American novelist.

Pendulum. A simple pendulum consists of a heavy particle, called the bob, suspended by a weightless cord from a fixed point, about which it can oscillate without friction. If the bob have a uniform circular motion in a horizontal plane, it constitutes a conical pendulum. If T be the time of a complete oscillation to and fro, l the length of the pendulum, and g the acceleration of gravity; then $T=2\pi\sqrt{\frac{l}{g}}$ (1). A compound pendulum is any rigid body fixed at only one point o, and capable of oscillating about this point under the action of gravity. The point o is called the CENTER OF SUSPENSION (q.v.), and a straight line through o perpendicular to the plane of vibration is called the axis of suspension. If m be the mass of a compound pendulum, a the distance from the center of suspension o to the center of gravity c, and M its moment of inertia about o, then $T=2\pi\sqrt{\frac{M}{mag}}$ (2). Evidently the length L of a simple pendulum that oscillates in the same time is $\frac{M}{ma}$, or equal to the moment of inertia divided by the static moment. The point o^1 in a compound pendulum in the line of o and c at a distance L from o, is called the CENTER OF OSCILLATION (q.v.); the straight line through o^1, parallel to the axis of suspension, is called the axis of oscillation. The points o and o^1 are mutually interchangeable without affecting T, a principle discovered by Huyghens; the product of their distances from the center of gravity c, is k^2, where k is the radius of gyration. The point o^1 is sometimes called the CENTER OF PERCUSSION (q.v.), since there is no reaction at o if the pendulum be struck at o^1. L is sometimes termed the radius of oscillation. If in equation (1), we substitute T=2 seconds, then $l=\frac{g}{\pi^2}$, which is the length of a pendulum that makes a single vibration in one second. This is called a seconds pendulum. A cycloidal pendulum is one the bob of which, by simple mechanical means, is made to describe the arc of a cycloid instead of that of a circle. It has the advantage of being strictly isochronous, while a circular pendulum is not even approximately so except for small amplitudes.

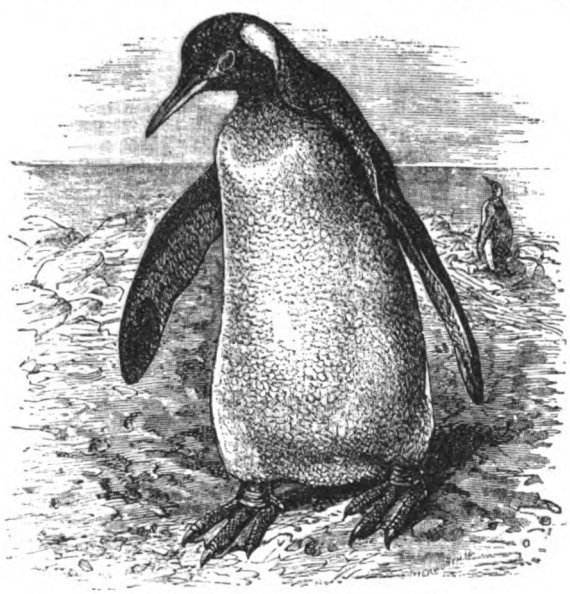
Pendulum, BALLISTIC. Instrument invented about 1765 by Robins for determining the initial velocity of a projectile. It consists of a pendulum having a strong and heavy bob to receive the impact of the projectile. From the relation of the momentum of the projectile before impact to that of the pendulum and projectile after impact the velocity of the projectile at the instant of striking is readily deduced.

Penelopē. Wife of Ulysses, King of Ithaca; during his absence of 20 years, besieged by importunate suitors, whom she put off by saying she must first finish a shroud for Laertes. Every night she undid the work of the previous day.

Peneus. Chief river of Thessaly. It flows through the vale of Tempe.

Pengelly, WILLIAM, 1812–1894. English geologist, engaged for 13 years in exploring KENT'S CAVERN (q.v.), Torquay. His reports conclusively established the coexistence of man with many of the extinct mammalia.

Penguins. Natatorial birds of the Antarctic Ocean. They show many features of a primitive type. The vertebræ are opisthocœlous, the wings fin-like, the feathers scale-like; the three short metatarsals are partly separate; the hallux turns forward and is webbed with the other three toes; the feathers are narrow and cover the body uniformly. The leg is short and placed far back; the foot is plantigrade. On land they sit



King-Penguin (*Aptenodytes pennanti*).

bolt upright and progress by a waddling gait, except the Rockhopper, which moves both feet at a time. In diving the feet are used as rudders: they have no quills in their wings, which they use in water as paddles, moving them alternately. One white egg, 3 by 4½ in., is laid in Oct. and incubated by both sexes for six weeks. They blow and scream like geese. A heavy layer of blubber exists beneath the skin. The voice of the Jackass Penguin resembles a bray. The King Penguin is 3 ft. high.

Penhallow, SAMUEL, 1665–1726. Colonist at Portsmouth, N. H., ab.1690; Chief-justice from 1717. *Indian Wars, 1703–26*, 1726.

Penicillate. In Botany and Zoölogy, organs or organisms tipped or margined by tufts of slender processes or hairs.

Peninsular and Oriental Company. Chartered by Great Britain 1840 to carry mails and passengers between Great Britain and Australia, China, and India. It has about 60 vessels.

Peninsular War. 1808–14, between the French and the combined forces of Spain, Portugal, and England, mainly under Wellington; ended by the victory of Toulouse, the French being driven out of the peninsula. It was caused by Napoleon's attempt to seat his brother Joseph on the throne of Spain.

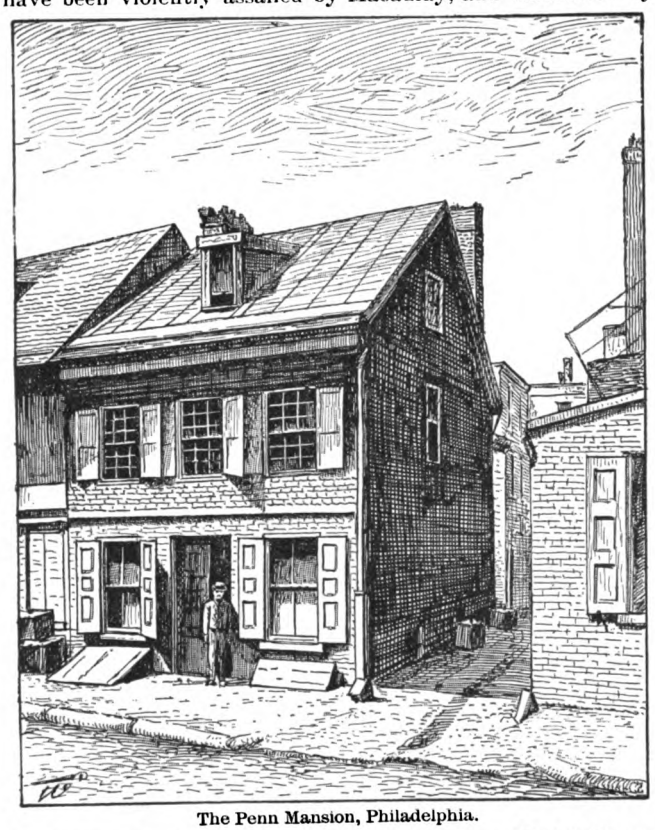
Penitential Psalms. 6, 32, 38, 51, 102, 130, and 143; so designated from ab. 200.

Penitentiary. See PRISONS.

Penn, JOHN, 1741–1788. Delegate to Congress from N. C. 1775–77 and 1779; signer of the Declaration of Independence.

Penn, WILLIAM, 1644–1718. Founder of Pa. He received the grant of the province 1681 in compensation for a debt due his father, Admiral Penn, and was made proprietor of the colony, which he twice visited, 1682 and 1699. His administration was distinguished by the magnanimity and justice of his treatment of the native Indians. He was twice imprisoned as a Quaker, once in the Tower, 1668, where he wrote *No Cross, No Crown*, and 1671 in Newgate, where he composed *The Great*

Cause of Liberty of Conscience. His character and motives have been violently assailed by Macaulay, and vindicated by



The Penn Mansion, Philadelphia.

later writers.—Two of his grandsons, JOHN, 1729–1795, and RICHARD, 1735–1811, were lieut.-governors of Pa.

Pennæ. Contour feathers; they have stiff shafts and a firm vexillum or vane.

Pennant, THOMAS, LL.D., F.R.S., 1726–1798. Welsh traveler, antiquarian, and scientist. *British Zoölogy*, 4 vols., 1765–77; *Tours in Scotland*, 3 vols., 1771–75; *Tours in Wales*, 1778–81; *Arctic Zoölogy*, 1785–87; *Literary Life*, 1793.

Pennatulidæ. Sea-feathers or Sea-pens. Family of alcyonarian Polyps, aggregated in colonies, supported on a common stem, and having a horny, flexible skeleton. *Renilla* belongs here; it, however, has no axis. It is a pinkish, heart-shaped disk with a short fleshy stem; the upper surface is covered by the white polyps, among which a certain amount of differentiation of structure and function obtains.

Pennell, MRS. ELIZABETH ROBINS, b. 1855. American author and traveler. With her husband, JOSEPH PENNEL, the artist, she has written much descriptive matter.

Pennine Alps. See ALPS.

Penninerved. Pinnately veined leaves.

Pennington, WILLIAM SANFORD, 1757–1826. Justice N. J. Supreme Court 1804; Gov. of N. J. 1813–15; U. S. District Judge from 1815. *N. J. Supreme Court Reports*, 1803–16.—His son, WILLIAM, 1796–1862, was Gov. of N. J. 1837–43, M.C. 1859–61, and Speaker 1860.

Pennsylvania. One of the e. States; rudely rectangular in form. Its area is 45,215 sq. m.; its surface is very broken. The s.e. part is a rolling plain: the middle portion is made up of narrow parallel ridges running n.e. and s.w., being the continuation n.e. of the great Appalachian valley. This is succeeded on the n.w. by the Allegany plateau, which from an abrupt escarpment slopes gently n.w. toward lower country. This plateau has been so eroded by streams as to present the appearance of a rugged mountain region. The State is well watered, but the only navigable streams are the Delaware, on the e. boundary, as far as Trenton; the Ohio, in the w. part, to Pittsburg, and its n. fork, the Allegany, for a long distance above Pittsburg, while the Monongahela has been rendered navigable by means of slackwater navigation to the boundary of W. Va. The surface geology of the State is almost as varied as its topography. The Allegany plateau is almost entirely composed of the Carboniferous formation, and this appears in several localities in the valley country s.e., interspersed with outcrops of Devonian and Silurian. The lower and more rolling country is largely Triassic, with occasional outcrops of older rocks. The industries of P., while very varied, are characterized by the extensive mining of coal, both anthracite and bituminous, and of iron, and by the extensive manufacture of iron and steel. Practically all the anthracite coal of the U. S. is found in this State, in a few small localities toward its n.e. part. Bituminous coal is mined very widely over the Allegany plateau and in many localities in the valley section. The State has a very extensive railroad system, which had in 1895 a mileage of 9,661. The population in 1890 was 5,258,014, of which ab. ¼ were of foreign birth. Of its total population, 2,152,051 may be classed as urban, living in cities of 8,000 inhabitants or more. The principal cities are Philadelphia, on the Delaware, at the mouth of the Schuylkill; Pittsburg, at the junction of the Allegany and Monongahela, and its suburb, Allegany. P. was a part of the territory of which the Dutch took possession 1623. In 1681 a charter was granted to William Penn, and P. was governed as a proprietary colony by Penn and his family until the Revolution. A dispute between Md. and P. as to the boundary between the two provinces was settled by Mason and Dixon's establishment of the line which bears their name. P. was one of the foremost colonies in the Revolution in resisting the British, and some of the most important battles were fought on her soil. During the Civil War it was the only northern State invaded: one of the most decisive battles was fought at Gettysburg 1863. In 1890 there were 18,364,370 acres in farms; the value of farm products in 1889 was $121,328,348. The mineral production in 1895 was: bituminous coal, 51,813,112 tons; anthracite coal, 58,126,345 tons; coke, 6,355,813 tons; iron ore, 697,985 long tons; pig iron, 4,701,163 long tons; steel, 3,883,280 tons; cement, 400,998 bbls. (300 lbs.); roofing slate, 376,068 squares (100 sq. ft.); other slate, 2,942,999 sq. ft.; petroleum, 18,231,442 bbls. of 42 gals.; natural gas, value $5,852,000.

Pennsylvania, UNIVERSITY OF. At West Philadelphia; chartered 1779; united 1791 with the College and Academy of Philadelphia, chartered 1755, which had been developed from a charity school started 1740. Its medical department, the oldest in America, dates from 1765; it has offered a 4-years' course since 1893. The law school was founded 1789. In the college departments (1896) are 106 instructors, in all 251; with 871 collegiate students, 172 in philosophy, 313 in law, 873 in medicine, and 2,632 in all. 450 courses are offered. The libraries contain 135,000 vols. Women are admitted to graduate courses. The work is organized in 13 departments, the college being one (subdivided in 10 courses), and occupies 23 buildings. It was removed to its present location 1872.

Pennsylvania College. Established 1832 at Gettysburg, Pa.; under Lutheran control. It has 15 instructors and ab. 250 students, including the preparatory department.

Pennsylvania Dutch. Dialect developed among immigrants to Pa., on a s. German basis. It has a limited literature, including poems by H. Harbaugh and C. C. Ziegler.

Pennsylvania State College. At State College, Pa.; began as Farmers' High School 1859: named Agricultural College 1862, and State Coll. 1874. It is organized in 7 schools, and offers 12 full and 8 short courses, mainly in the applied sciences. There are 52 instructors. General library, 10,500 vols., with special libraries in the departments.

Penny. English silver coin, first struck ab.700. Its value declined till ab. 1560, and has since been $\frac{1}{12}$ shilling. Copper

Penny of William I.

half pence and farthings have been minted from 1672, pennies since 1797. The Scotch coinage was of much lower value.

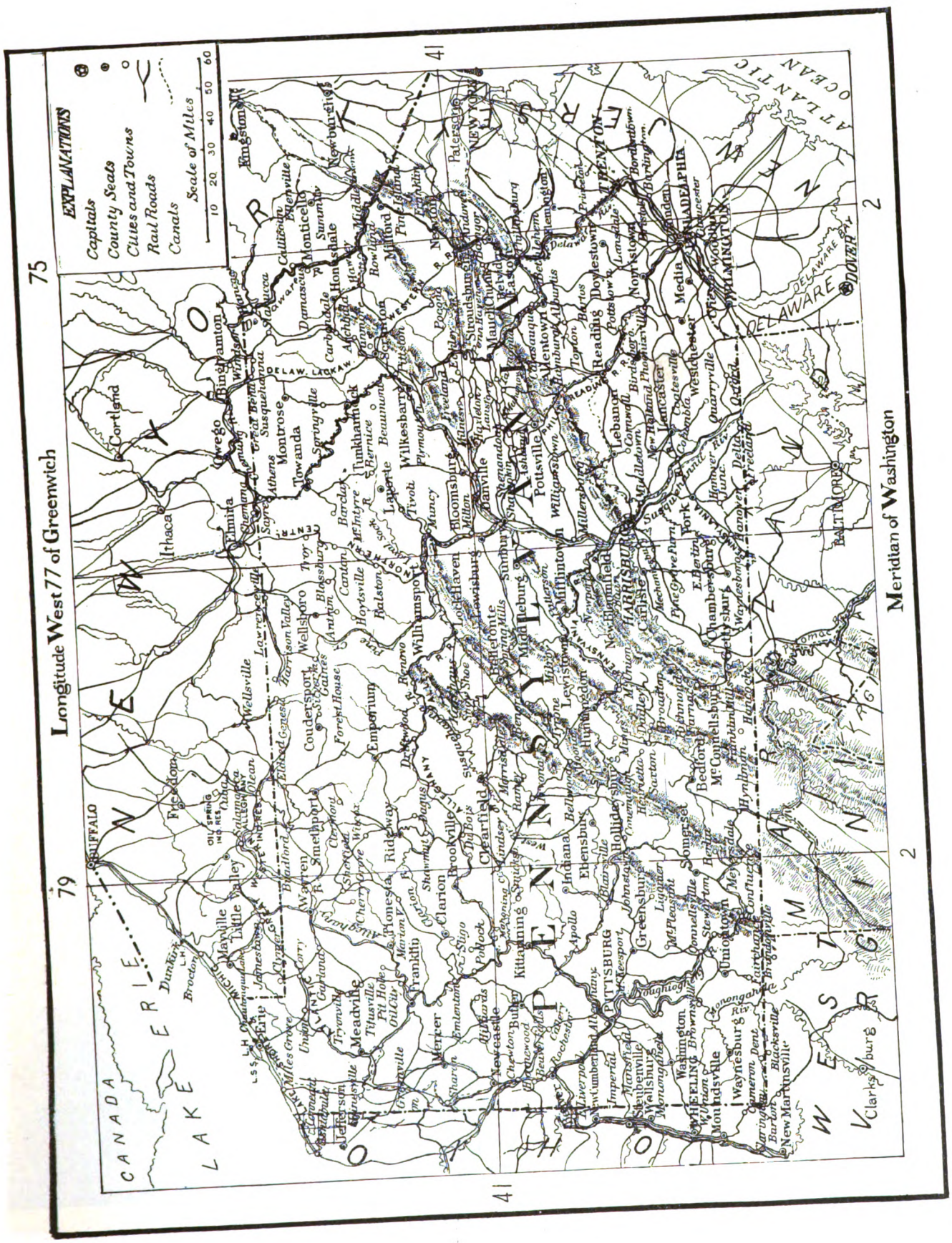
Penny, VIRGINIA, b. 1826. American writer on employments of women, 1863–68.

Pennycress. *Thlaspi arvense.* Herb of the Mustard family, native of Europe, introduced as a weed into America; known as Mithridate Mustard.

Penny Postage. See POST-OFFICE.

Pennyroyal. *Mentha pulegium.* Herb of the Mint family, native of Europe, cultivated for its pungent volatile oil.

Pennyroyal, AMERICAN. Low odorous herbs of the genus *Hedeoma*, of the Mint family, natives of America. The common e. species is *H. pulegioides*, and has nearly the taste and odor of the true Pennyroyal. *Mentha canadensis* has similar properties and is also called Pennyroyal. These are used as a domestic medicine.


EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
Longitude West 77 of Greenwich
Meridian of Washington
75
79
41
2
CANADA
LAKE ERIE
ATLANTIC OCEAN
DELAWARE BAY
DELAWARE
BALTIMORE
DOVER
TRENTON
PHILADELPHIA
WILMINGTON
PITTSBURG
HARRISBURG
YORK
LANCASTER
READING
ALLENTOWN
SCRANTON
WILKESBARRE
BINGHAMTON
ELMIRA
ITHACA
OSWEGO
BUFFALO
ERIE
Clarksburg

Penny Weddings. Seventeenth century practice in Scotland. The invited guests contributed a small amount of money, seldom more than a shilling, to pay the general expenses of the wedding. It was denounced 1645 by an Act of the General Assembly.

Pennyweight. In Troy weight, 24 grains. See WEIGHTS and MEASURES.

Pennywort, WATER. Low marsh herbs of the genus *Hydrocotyle*, natural family *Umbelliferæ*, of wide geographical distribution.

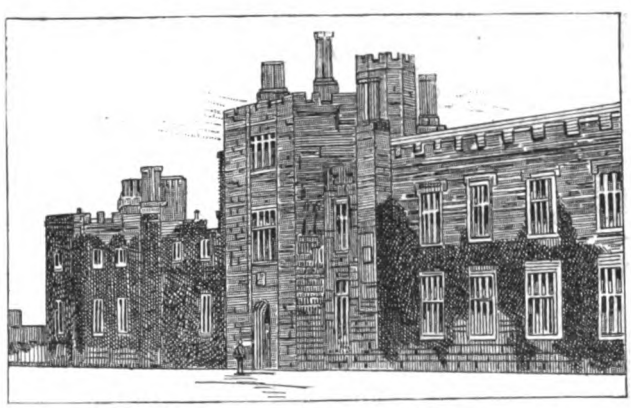
Penobscot. Chief river of Me. It heads in the w. part of the State, flows e. and s.e., and then s. to P. Bay. It is navigable to Bangor. Length ab. 300 m., drainage area 8,934 sq. m., discharge 2,438 cu. ft. per second.

Penology. See PRISON DISCIPLINE.

Penry, JOHN (AP HENRY), 1559–1593. Welsh Puritan, unjustly executed.

Pensacola. City of Escambia co., Fla., on P. Bay. It has a good harbor and considerable commerce. It was an old Spanish settlement, held for a time by the British, taken by Jackson 1814, and annexed with Fla. 1819. The Navy-yard near by was seized by Confederates Jan. 1861, but regained 1862. Pop., 1890, 11,750.

Penshurst. Town in Kent, England, at the confluence of the Eden and the Tun, 4½ m. w.s.w. of Tunbridge. It is noted



Front Entrance of Penshurst Palace.

for its old homes. P. Palace is the birthplace of Sir Philip Sydney 1554. Pop. 2,000.

Pension. Sum paid from time to time by government, or a former employer, in consideration of past services. June 30, 1896, there were 970,678 names on the pension rolls of U. S.: War of 1812, 7 survivors, 3,287 widows; Mexican War, survivors 11,800, widows 8,017; Indian Wars, survivors 2,718, widows 4,237; War for the Union, 1861–65, invalids 749,530, widows, etc., 191,082. The total disbursements for the year ending June 30, 1896, were $139,280,075; from 1861–96, $1,997,515,154.72. The amount paid for pensions by Great Britain annually for army, navy and civil lists is ab. £7,500,000.

Pensionary, GRAND. Sec. of Holland till 1795. His duties were largely financial and diplomatic. Barneveldt made the post eminent.

Pentacarpellary. Ovary of five carpels.

Pentacle. Five-pointed figure used as a symbol of mystery, perfection, or of the universe by Gnostics, Neoplatonists, and Pythagoreans. In the Middle Ages it was used to keep off evil spirits and witches.

Pentacrinites. Group of Crinoids with pentangular stems.

Pentacrinus. Most common of living species of CRINOIDS (q.v.); stone-lilies.

Pentactine. Sponge spicule, produced from a hexactine by suppression of one ray.

Pentadelphous. Flowers whose stamens are united into five sets, as in the Basswood.

Pentads. In Chemistry, elements having a valence of V.

Pentagon. Polygon of five sides.

Pentagynia. Order of plants which have five pistils.

Pentagynous. Flowers with five pistils.

Pentamera. *Coleoptera*, with five-jointed tarsus. Here are included most of the Beetles, such as the Spring-beetles (*Elateridæ*), *Lamellicornia*, *Palpicornia*, Swimming-beetles (*Dytiscidæ*), Tiger-beetles (*Cincindelidæ*), and the great family of Running-beetles (*Carabidæ*). See these terms.

Pentameron. Fifty Neapolitan stories by G. Basile 1637. Thirty-one of them were tr. 1848.

Pentamerous. Having five similar parts; *e.g.*, arms of a Starfish, and joints in the tarsus of certain beetles.—In Botany, flowers constructed on the plan of five members of each circle of parts, or the quinary plan.

Pentameter. Verse of five feet; abridged hexameter, common in Greek, Latin, and modern poetry.

Pentamethyl Pararosaniline. See METHYL VIOLET.

Pentandria. Linnæan class of plants, comprising all those which have five separate stamens, as in Forget-me-not, Potato, Cowslip, Violet, and Flax.

Pentandrous. Flowers with five stamens.

Pentane. C_5H_{12}. Amyl hydride; known in three forms; which are liquids boiling 9°–37° C.; present in crude petroleum, and a considerable constituent of petroleum ether; used in standard burners to furnish a standard of light.

Pentapetalous. Corolla of five petals.

Pentaphyllous. Calyx or corolla composed of five leaves (sepals or petals).

Pentasepalous. Calyx composed of five sepals, as in the Apple.

Pentastichous. Five-ranked, as the arrangement of the alternate leaves in the Apple, the scales of a Larch cone, and numerous other plants.

Pentastomida. See LINGUATULIDA.

Pentateuch. "Five books of Moses," first of O. T.

Pentathionic Acid. $H_2S_5O_6$. Made by the action of hydrogen sulphide upon a solution of sulphur dioxide in water.

Pentathlon. Five exercises of running, leaping, wrestling, throwing the discus, and throwing the spear, popular in ancient Greece.

Pentecost. In Israel, second of the three great feasts, celebrated fifty days after the Passover, commemorating the harvest.—In the Christian Church, day of the Descent of the Spirit.

Penthesilea. Queen of Amazons; ally of Priam; slain by Achilles.

Pentheus. King of Thebes; driven mad by Bacchus and torn in pieces by his mother and aunts in a Bacchic frenzy.

Pentland Firth. Between Scotland and the Orkneys, connecting North Sea and Atlantic.

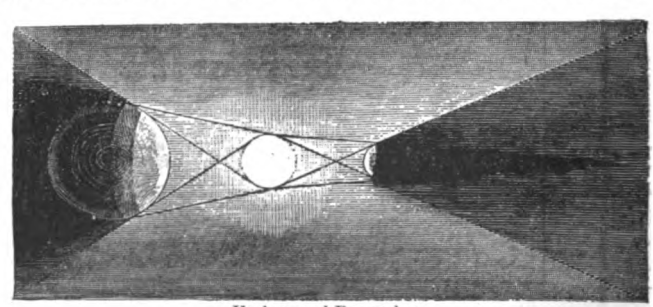
Pentland Hills. S.w. of Edinburgh; 16 m. long. Greatest altitude 1,898 ft. Here a body of Covenanters was defeated Nov. 28, 1666.

Pentonville. District of London, containing a model prison, erected 1840–42.

Pentremites. See BLASTOIDEA.

Pentyl Alcohols. $C_5H_{11}OH$. Seven compounds of this formula are known. Only two are of importance, the AMYL ALCOHOLS (q.v.).

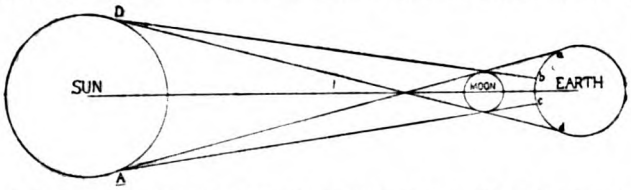
Penumbra. One of the results of the rectilinear propagation of radiation is the production of shadows cast by opaque objects. If, *e.g.*, a disk be held opposite a candle flame, and straight lines be drawn from the flame tangent to the edge of the disk, the conical space behind the disk which receives no



Umbra and Penumbra.

light is called the shadow. If the source of light be a point, the edges of a plane section of the shadow are sharp. If it have an appreciable surface, the edges of the shadow shade off gradually. This surrounding region, through which the dark portion or the umbra shades off gradually, is the penumbra.

Penumbra OF THE SHADOW OF THE EARTH OR MOON. That part of the shadow within which the sun's light is only partially cut off. In those portions of the earth, traversed by



In case of an eclipse of the sun, those parts of the earth between *a*, *b* and *c*, *d* respectively would be within the penumbra, and the eclipse is partial.

the moon's umbra or true shadow, the eclipse would be total; where the penumbra or partial shadow falls, the eclipse would be partial. The greatest breadth of the former is 180 m. and of the latter 4,900 m.

Peons. Mexican and S. American serfs, under Spanish laws for debt.

Peony. *Pæonia officinalis.* Large perennial herb of the natural family *Ranunculaceæ*, native of central Europe, widely cultivated for ornament. There are numerous other species, two indigenous in California.

People's Palace. Institution at Mile End Road, inaugurated by the Queen 1887 and intended for the recreation and amusement of the inhabitants of the East End of London. It comprises technical schools, art galleries, concert halls, gymnasium, etc.

Peoria. City of P. co., Ill., on the Illinois; founded 1779. It is entered by 11 railroads, is regularly laid out and has extensive manufactures. Pop., 1890, 41,024.

Pepe, GUGLIELMO, 1873–1855. Italian officer in Spain; leader of a revolt in Naples 1820; in exile 1821–48, when he held Venice for the patriots; historian of the events in which he bore part.

Peperino. Variety of tuff found near Rome.

Pepin, LAKE. Extension of the Mississippi River between Wis. and Minn., 1 m. below the junction of the St. Croix River. Length 24 m., width 2–4 m.

Pepin, or PIPPIN, "THE SHORT," 714–768. Son of Charles Martel and father of Charlemagne; became sole Duke of Franks 747; first king 752; at war with Bavarians, Saracens, Lombards, Saxons, and the Duke of Aquitania. He gave Ravenna, Pentapolis, and the duchy of Rome to the Holy See, and so laid foundation of temporal power.

Pepin of Heristal, d. 714. Founder of Carlovingian line of Frankish kings; Mayor of the Palace under several Merovingian kings; conquered Burgundy and Neustria 687; father of Charles Martel.

Pepo. Fleshy fruit, with a firm rind, composed of the thickened adnate calyx and ovary, as in the Pumpkin, Cucumber, and Melons.

Pepper. *Piper nigrum.* Herb of the natural family *Piperaceæ*, native of India, yielding from its berries the well known condiments black and white pepper. Red Pepper is derived from the fruit of a species of *Capsicum*, natural family *Solanaceæ*. Other plants produce a similar substance.

Black Pepper (*Piper nigrum*).

Pepper, WILLIAM, M.D., LL.D., b. 1843. Prof. Univ. Pa. since 1876, and its provost 1881–94.—His father, WILLIAM, M.D., 1810–1864, was prof. Univ. Pa. 1860–64.

Pepperbush. Shrubs of the genus *Clethra*, natural family *Clethraceæ*, natives of N. and S. America, bearing odorous white flowers. The two species of the U. S. are known as White Alder.

Peppercorn Rent. Acknowledgment of tenancy when lands are let virtually free of rent; one peppercorn a year to be paid on demand.

Pepperell, SIR WILLIAM, 1696–1759. Merchant at Kittery, Me.; Chief-justice of Mass. Common Pleas from 1730; leader of an expedition, the most famous of colonial times, which took Louisburg June 1745; Baronet 1746; acting Gov. of Mass. 1756–58; Lieut.-gen. 1759.

Peppergrass. Herbs of the genus *Lepidium*, natural family *Cruciferæ*, of wide geographical distribution; also called Pepperwort.

Pepperidge. *Nyssa sylvatica.* Large tree of the natural family *Cornaceæ*, native of swampy ground in the e. U.S., furnishing a valuable timber; called also Tupelo, and Black Gum or Sour Gum.

Peppermint. *Mentha piperita.* Odorous herb of the Mint family, native of Europe; cultivated and introduced into wet places in America, in Mich. and N. Y. See MINT.

Peppermint, OIL OF. Oil of *Mentha piperita.* The oil is used in confectionery and in medicine. Its essential constituent is MENTHOL (q.v.).

Pepper-Pot. Mixed dish of meat or fish with okra and red peppers, originating in W. Indies. In Pa. tripe with dough balls and red peppers are used.

Pepper-Root. Certain species of the genus *Cardamine*, herbs of the natural family *Cruciferæ*, natives of N. America; known as Toothwort.

Pepsin. Digestive ferment of the gastric juice. As found in the market it is usually prepared from the stomach of the hog, and is employed to aid weak digestion, acting on nitrogenous food only. It changes albuminoids into peptones. It is used in tablets.

Peptones. Bodies containing carbon, hydrogen, nitrogen, sulphur, and oxygen, produced by the action of pepsin upon albuminoids, and by the action of other similar ferments; easily soluble in water and not as readily coagulated as albumens.

Peptonized Food. Any article of food artificially digested by means of some preparation of the pancreas. Peptonized foods are used to afford nourishment when, from any cause, the power of digestion is impaired; *e.g.*, during the weakness consequent upon a low fever or where there is a chronic disease of the stomach. See PANCREATIN.

Pepys, SAMUEL, 1633–1703. Sec. to the Admiralty 1685–88; Pres. Royal Soc. 1684–86. His famous *Diary*, 1660–69, was first pub. 1825.

Pequigny. Town of France, on the Somme, near Amiens; notable for a treaty, signed Aug. 28, 1475, which arranged for a 7 years' truce between France and England. The English king engaged to quit France on receipt of 75,000 crowns, and to release Queen Margaret for a ransom of 50,000 more. A separate treaty provided for mutual aid in case of revolt in either kingdom.

Pequots, or PEQUODS. Tribe of Indians in Conn., which was hostile to the whites and caused several conflicts and massacres; nearly exterminated 1637 by a band led by John Mason, assisted by Uncas and the Mohegans. More than 600 Pequots were killed: others were sold as slaves to the W. Indies.

Pera. Suburb of Constantinople, occupied by foreigners and embassies; ravaged by fire 1870.

Peræa. Palestine e. of the Jordan, or part thereof, between Pella and Machærus.

Perak. Malay territory held by Britain from 1874. Area ab. 8,000 sq. m., pop. ab. 200,000.

Peralta, GASTON DE, MARQUIS DE FALCES, ab.1520–ab.1580. Viceroy of Mexico 1566–67; noted for justice and humanity; Constable of Navarre 1568.

Peralta, MANUEL MARIA DE, b. 1847. Costa Rican author and diplomatist, well known at Washington 1875–78 and later.

Peralta-Barnuevo, PEDRO, 1663–1743. Peruvian author.

Perameles (BANDICOOT). See ENTOMOPHAGA.

Peramelidæ. See ENTOMOPHAGA.

Per Capita. By heads; according to the number of individuals. See PER STIRPES.

Percentage. Process and result of reckoning by the hundred. The primary elements are the base and the rate per cent: their product is the percentage. The base being given in units, the rate is expressed decimally.

Perception. Psychologically, process of acquiring knowledge of the external world by means of the senses. The basis of perception is therefore sensation, but something more is needed. The object to be perceived must not only arouse a sensation, but must be discriminated, recognized, localized in space and time, and assimilated into the body of conscious ex-

perience. Perhaps the most important act in the complex process of perception is the movement of attention, which brings the sensation or the object producing it into the focus of consciousness, and allows the operation of the processes necessary to the development of perception.

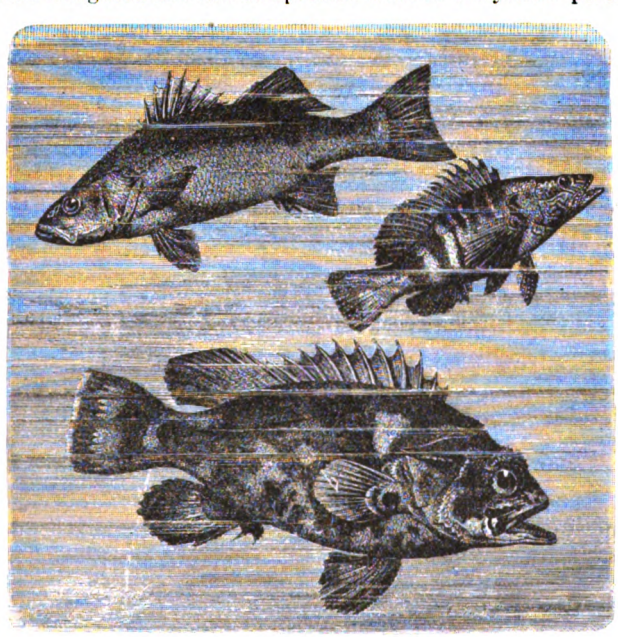
Percesoces. Sub-order of Acanthopterous fishes, including the Mullets (*Mugilidæ*), Smelts (*Atherinidæ*), and Barracudas (*Sphyrænidæ*). These fishes stand between the Perches and the Pikes. They have the ventral fins abdominal in position, the spinous dorsal well separated from the soft dorsal, branchial arches well developed and scales cycloid. The largest species (*Mugil albula*) averages 2 lbs. in wt. They come in schools to spawn in June. They feed on the mud of the bottom, having a gizzard-like stomach and an extra long intestine; but the mud is partly culled before it is swallowed; the indigestible pieces are thrown out of the mouth. A special arrangement of the pharyngeal bones acts as a filter in the throat. The head is flat and scaly, the body is of pike-like proportions, but has two dorsal fins, and the ventrals are below the pectorals. The anterior dorsal is spiny.

Perceval, AMAND-PIERRE CAUSSIN DE, 1795–1871. French Arabic scholar.

Perceval, JOHN, 1680–1748. Irish baronet 1691, Baron 1715, Viscount 1722, Earl of Egmont 1733; grantee of a charter to colonize Georgia 1732.—His grandson, SPENCER, 1762–1812, became M.P. 1796, Atty.-gen. 1802, Chancellor of the Exchequer 1807, Prime Minister 1809, and was murdered.

Percheron. See HORSE.

Perches. *Percidæ*, including a large number of species of *Acanthopteri*. Some are called Pikes, or Pike-perches. Of these the wall-eyed pike, *Stizostedion vitreum*, is a prominent example. It may attain a weight of 10 to 30 lbs.; the body is more elongated and less compressed than in the yellow perch.



1. Sea Bass (*Labrax lupus*), 2. Striped Bass (*Serranus scriba*), 3. Wreck Bass (*Polyprion cernuum*).

The principal fishery for this species is Saginaw Bay, Lake Huron. The white perch (*Morone*) belongs to the *Labracidæ*. The sub-family *Etheostominæ* includes the Darters, which are considered minute perches. The SUNFISHES, q.v., (*Lepomis*) and Black Bass (*Micropterus*) of the *Centrarchidæ* have 3 or more anal spines and rudimentary pseudobranchs, while the Sea Bass (*Roccus* or *Labrax*) of the *Serranidæ* have large pseudobranchs. These families are by some authors included in the Perch family, here restricted to perches with 1 or 2 anal spines, and rudimentary pseudobranchs (except *Stizostedion*).

Perchers (BIRDS). See INSESSORES.

Perchlorates. Metallic derivatives of perchloric acid.

Perchloric Acid. $HClO_4$. Colorless, fuming liquid, very unstable and explosive. It produces bad wounds when brought in contact with the flesh. It is made by treating potassium perchlorate, $KClO_4$, with sulphuric acid.

Percival, JAMES GATES, 1795–1856. American poet, of considerable repute in the past; geologist of Wis. 1854. *Clio*, 1822–27.

Percurrent. Midvein of a leaf when it extends to but not beyond the apex.

Percussion. The sudden stopping of a body by impact, from which the term has been applied to shells to be exploded upon striking by means of a percussion fuse: the means employed to discharge the musket by a percussion cap, within which is placed a small charge of fulminate. Explosion in such cases is produced by the conversion of mechanical energy into heat.

Percussion. Process in physical diagnosis, which, by tapping various parts of the body, more particularly the chest and abdomen, gives an indication of the physical condition of the organs beneath by the resultant sound.

Percussion Cap. Small copper cylinder containing fulminating powder, a mixture of 7 parts mercury fulminate and 2 parts potassium chlorate, placed in the lock of a gun to explode the charge. See FULMINATES.

Percussion Table. Apparatus used in ore-dressing, in which the pulp flows in a thin sheet over the surface of an inclined table, and is kept in agitation by a succession of blows given either at the upper end or at the side of the table.

Percy, HENRY, d. 1408. Fourth Baron of Alnwick; first Earl of Northumberland 1377.—His son, HENRY ("HOTSPUR"), 1364–1403, victor of Chevy Chase, 1388, was killed at Shrewsbury, and celebrated by Shakespeare. Others of this line were prominent in war and intrigue.

Percy, JOHN, 1817–1889. Physician in the Queen's Hospital, Birmingham, 1842–51; Lecturer on Metallurgy to the Royal School of Mines 1851–79; pres. Iron and Steel Institute 1885–87. His works on Fuel, Iron and Steel, Silver and Gold, and the metallurgy of the other metals, pub. 1869–80, are standard works, and have been tr. into French, German, and Spanish.

Percy, THOMAS, D.D., 1728–1811. Bp. of Dromore 1782. His *Reliques of Ancient English Poetry*, 3 vols., 1765, is an important collection of ballads, freely revised and enlarged by his own hand.

Percy Anecdotes. Famous collection, published in London, in monthly parts, 1820–23, by Thomas Byerley, d. 1826, and Joseph C. Robertson, d. 1852, who wrote under the name of Shilto and Ruben Percy.

Perdiccas. Kings of Macedonia ab.700, 454–413, and 365–360 B.C.

Perdiccas, d. 321 B.C. General of Alexander, and temporary regent after his death, holding his signet-ring.

Pereda, JOSÉ MARIA DE, b. 1833. Spanish novelist and descriptive writer.

Péréfixe, HARDOUIN DE BEAUMONT DE, 1605–1671. Bp. of Rhodes 1649, Abp. of Paris 1662; persecutor of Port Royal.

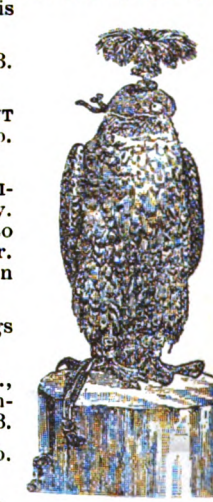
Peregrine Falcon (FALCO PEREGRINUS). Hawk formerly used in falconry. It is a very swift flyer. It is known to have attained a speed of 150 m. an hour. The male, called Tercel, is smaller than the female.

Pereiopod. One of the walking legs of the lobster and of allied *Crustacea*.

Pereira, JONATHAN, M.D., F.R.S., 1804–1853. Practitioner and prof. in London. *Materia Medica*, 1839–40; *Diet*, 1843.

Pereira da Silva, JOAO MANOEL, b. 1817. Brazilian historian.

Pereira de Figueiredo, ANTONIO, 1725–1797. Portuguese priest of the Oratory. He tr. the Bible and wrote much against the Jesuits.



Hooded Peregrine on the block.

One end of the leash is attached to the jesses, the other to a ring driven into the side or top of the block; and thus the hawk is prevented from escaping.

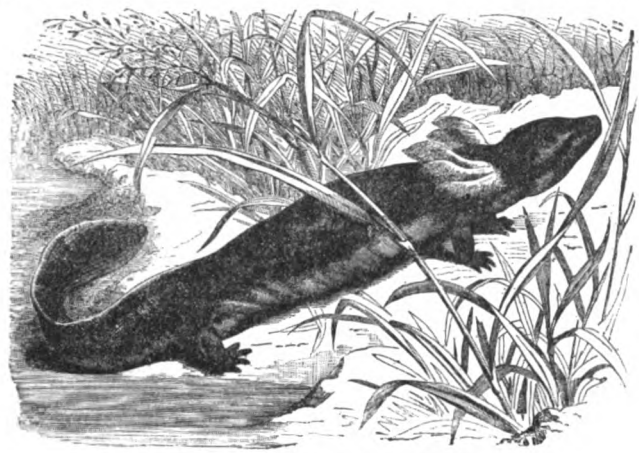
Perekop, ISTHMUS OF. In Russia, connecting the Crimea with the mainland of European Russia. It is crossed by a ship canal.

Père-la-Chaise. Cemetery in e. Paris; named from the Jesuit confessor of Louis XIV., whose garden was converted into this burial place 1804.

Perennial. Vegetable structures which endure indefinitely, year after year.

Perennibranchiata (PROTEIDA, SOZOBRANCHIA). Tribe of *Ichthyoidea* (Urodele Amphibians), including forms having

external gills throughout life, but no maxillary bones. The teeth are in several rows, and borne by the vomer and palatine bones. Here are included: the Siren, or Mud-eel, of S. C., with eel-like body and no posterior limbs; the Proteus of s. Europe,



Mud-Puppy (*Necturus maculatus*).

living in subterranean waters, having three toes on the fore feet, two on the hind feet, and only two pairs of gill slits; and the Necturus or Menobranchus (known popularly as the Mud-puppy or Water-lizard), with four-toed feet and four pairs of gill slits, abundant in the Great Lake region and Upper Mississippi system.

Perennichordata. See COPELATÆ.

Perez, ANTONIO, 1539–1611. Sec., agent, and scapegoat of Philip II. of Spain. Tried for the murder of Escovedo, emissary of Don John of Austria, he confessed under torture, escaped to Aragon, was there repeatedly delivered by popular risings, and fled to France 1591. *Relaciones*, 1598.

Pérez, JOSÉ JOAQUIN, b. 1801. Pres. of Chili 1861–71.

Pérez, SANTIAGO, b. 1830. Colombian author and Senator, twice Minister to the U. S.

Pérez de Hita, GINÉS. Spanish author. His *Civil Wars of Granada*, 1595–1604, a mixture of history and romance, has been drawn on by other writers, from Calderon to Irving.

Pérez Galdós. See GALDÓS.

Perfect. Flowers which contain both stamens and pistils.

Perfection, IN ETHICS. Excellence of human nature considered as a rational end for moral action.

Perfectionism. Doctrine professed by many Methodists, some Roman Catholics, and others, that man may through grace attain a sinless state in this life. It is disowned by most Christians.

Perfectionists. Sect founded 1838 in Vt. by J. H. Noyes; transferred 1847 to Madison co., N.Y., and known as the Oneida Community.

Perfect Square. Quantity whose two equal factors can be exactly expressed.

Perfoliate. Sessile leaves having the stem on which they are borne passing through the lower portion of their blades.

Perforata. Section of *Foraminifera*, including the orders TEXTULARIDEA, CHILOSTOMELLIDEA, LAGENIDEA, GLOBIGERINIDEA, ROTALIDEA, NUMMULINIDEA (q.v.).

Perforata. Division of the Madrepore corals. See MADREPORARIA.

Perforated Cake Powder. Used in heavy guns; hexagonal powder prisms having seven perforations from upper to lower base; made by moistening and reworking ordinary grained powder of sp. gr. 1.5 and subjecting it to a pressure of ab. 65,000 lbs. per sq. in. in hexagonal molds. Each prism weighs ab. 555 grs. and has sp. gr. ab. 1.7. Combustion proceeds from interior perforations on increasing surface, and the amount of gas evolved is better proportioned to perform its work with less initial pressure on the bore than in the case of single grained powder.

Perforate Shell. Gastropod shell with a hollow columella.

Perfumery. Art of preparing essences and perfumes. A good perfume should leave no residue on evaporation. Some of the most exquisite perfumes are obtained from the most offensive substances: the oil of pineapple being produced from sugar and putrid cheese. Most of the perfumes come from the vegetable kingdom; musk, civet, castor, and ambergris being from the animal, but chemistry has shown how to obtain them from other sources. In 1889 there were grown in France for perfumery 1,860 tons of orange blossoms; and in Bulgaria 5,660 lbs. of attar of roses were made, requiring 3,200 lbs. of rose petals per pound.

Pergamus. City of Mysia, w. Asia Minor; capital of Attalus I., 241–197 B.C.; bequeathed to Rome 133 B.C.; long wealthy and populous; seat of a flourishing school of Greek

Restoration of the great Altar Building at Pergamus, by R. Bohn.

art in 2d century B.C. Its library of 200,000 vols. was given to Cleopatra by Antony, and added to that of Alexandria. Its ruins were excavated 1878–86, and many sculptures were taken to Berlin.

Pergolesi, GIOVANNI BATTISTA, 1710–1736. Italian composer of the Neapolitan school, best known by his opera *La Serva padrona*, 1733, and a *Stabat Mater* for two women's voices with accompaniment of strings.

Perham, SIDNEY, b. 1819. M.C. 1863–69; Gov. of Maine 1871–74.

Peri. In Oriental Mythology, a Being, harmless or beneficent, and immortal, but not to be admitted to Paradise; most familiar through Moore's poem.

Peri, JACOPO, ab.1600. Florentine musician, one of the creators of the lyric drama (see OPERA). He composed the opera *Euridice*, performed at the marriage of Henry IV. of France.

Periander, ab.665–585 B.C. Tyrant of Corinth.

Perianth. Floral envelopes of a flower, especially in cases where the calyx and corolla are indistinguishable, or where one of them is wanting; sometimes called Perigone.

Periastre. That point in the orbit of a binary star where the secondary star approaches nearest to the primary.

Periblem. Layer of cells at the growing points of plants, which develops the bark; immediately beneath the epidermis.

Peribranchial Space. Space surrounding the branchial sac in Tunicates, etc.

Pericambium. Layer of thin-walled cells, found in the roots of dicotyledonous and gymnospermous plants, immediately within the endodermis; periphlæum.

Pericarditis. Inflammation of the pericardium. Frequently a sequel to inflammatory rheumatism. It is often accompanied by a dropsy of the part, known as hydropericardium.

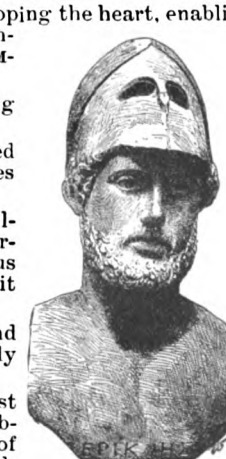
Pericardium. Serous sac enveloping the heart, enabling its movements to be carried on without undue friction. See SEROUS MEMBRANE.

Pericarp. Seed-vessel of flowering plants; ripened ovary-wall.

Perichætium. Cluster of modified leaves which surrounds the archegones in the flower of a moss.

Perichondrium. In Embryology, membranous investment of dermis which surrounds the cartilaginous cranium and becomes ossified about it to form the membrane bones.

Pericladium. Expanded and sheathing base of a petiole, especially in herbs of the Carrot family.



Pericles.

Pericles, ab.495–429 B.C. Greatest statesman of Athens. He entered public life 469, and by the ostracism of Thucydides 444 was left without a rival. He employed the ten years preceding the Peloponnesian war in adorning Athens with public buildings. His was the golden age of Greece.

Periclinium. Involucre of the compound flower or Anthodium of the *Compositæ;* also known as Periphoranthium.

Periderm. Hard cuticular layer developed in the cœnosarc of certain Hydroids.—In Botany, the tissue formed externally from the phellogen of stems. Its diminutive is peridiolum.

Peridium. Investing membrane of the puff-balls, truffles, and other fungi, consisting of several layers of densely matted hyphæ; also corky layer of the bark in exogenous stems.

Peridot. See CHRYSOLITE.

Peridotite. Group of basic igneous rocks containing olivine, but no feldspar.

Perienteron. Blastocœl cavity after the digestive cavity is established in embryos.

Perier, CASIMIR, 1777–1832. French Deputy 1817; Finance Minister 1828–29; Premier 1831. His policy was that of the *Juste Milieu.*

Périers, JEAN BONAVENTURE DES. See DES PÉRIERS, BONAVENTURE.

Perigastric Cavity. Perivisceral cavity; body cavity outside of the alimentary canal.

Perigee. Point of the moon's orbit nearest the earth.

Perigenesis. Theory of heredity, according to which protoplasm is made up of small bodies called plastidules, each of which is an organized system of molecules, each molecule having a peculiar form of vibration; the character of the whole is determined by the forms of these vibrations. The vibrations are complex and run through cycles so as to return periodically to the same phase as a result. The plastidule also undergoes a cyclic change of its powers. Changes in the environment modify the vibration systems, and also determine the resultant effective work of the molecule in adding other molecules, or of the plastidule in splitting into new plastidules, for growth is the one and cell-division results from the other. A modification of the system of vibrations constitutes variation, and must always be impressed from without. Thus Hæckel accounts for the cyclic development of ontogeny and the branched development of phylogeny. As to the branched development of the differentiation of tissues, he supposes a similar modification of the vibration along different lines, as each cell divides, due to environment. Development is a purely mechanical process, capable of being represented mathematically and graphically. See WEISMANN'S THEORY OF HEREDITY.

Perigone. See PERIANTH.

Perigonium. Walls of a sporosac or reproductive bud in Medusoids. When mature there are three layers, a middle, mesotheca, an outer, ectotheca, and an inner, endotheca.

Perigueux. City of France, 42 m. s.e. of Angouleme, the ancient Vesunna of Cæsar's time. Here are the remains of a Roman amphitheater. It has an archæological museum rich in inscribed stones. Pop., 1891, 28,000.

Perigynium (PERIGYNE). In Botany, sac which incloses the pistil and achenium in the genus *Carex;* also perichætium of *Bryophytes.*

Perigynous. Stamens inserted around the pistil of a flower, either on the calyx or corolla; also, disk of a flower when adnate to the base of the calyx.

Perihelion. Point in a planet's or comet's orbit nearest the sun.

Perimeter. Bounding line of a plane figure.

Perimeter. Instrument used for determining the area of the field of distinct vision of the eye.

Perineum. In Regional Anatomy, the lowest part of the trunk found between the joining of the thighs to the trunk.

Perinium. Third layer of cells existing on the spores of certain *Jungermanniaceæ*, often beautifully sculptured.

Period. In simple harmonic motion, interval of time between two successive passages of the vibrating body through a given point of its path in the same direction.

Period. In Mathematics, two or more consecutive digits of a number, considered together.

Periodates. Salts derived from periodic acid, HIO_4, or from derivatives of normal periodic acid, $I(OH)_7$.

Periodic Acid. HIO_4. Simplest form, made by treating perchloric acid with iodine; white crystals, containing $2H_2O$.

Periodicals. Magazines and reviews, usually pub. monthly or quarterly; numerous of late in all civilized lands, and occupying a middle place between newspapers and ordinary books. The Royal Society's *Transactions* began 1665, the *Journal des Savants* also 1665, and the *Gentleman's Mag.* 1731.

Periodic Function. One in which the same value recurs at regular intervals in the change of the variable.

Periodic Law. In Chemistry, the properties of the elements are periodic functions of their atomic weights.

Periodic Table. Arrangement of the chemical elements in groups and series, in the order of their atomic weights, showing the relation of the properties of the elements and their atomic weights. Such tables have been arranged by Mendeléff and by Lothar Meyer.

Period of Sun Spots. Discovered by Schwabe of Dessau. It is not absolutely constant, but is approximately $11\frac{1}{10}$ years in length. The last maximum epoch was 1895.

Periœci. People of the native race in Lacedæmon, whose ancestors occupied before the Dorian conquest; regarded by the Spartans as inferiors, but not generally oppressed.

Periostitis. Inflammation of the periostium. It is most frequently experienced in the membrane investing the roots of the teeth; dental periostitis.

Periostium. Sheath of fibrous tissue enveloping bones, except over the articular surfaces. Externally it affords a surface to which the muscles can be attached; internally it serves to give nourishment to the bone and to regenerate the bony tissue, should it be destroyed.

Periostracum. Epidermal layer on outside of shells of mollusks.

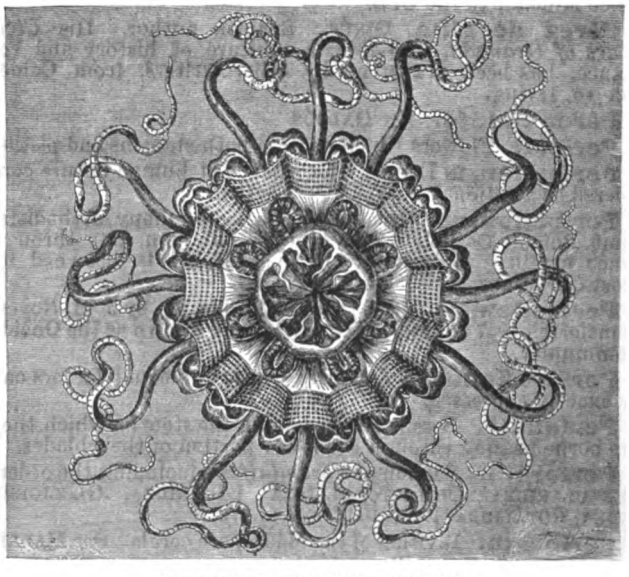
Peripatetics. Disciples of Aristotle. See LYCEUM.

Peripatus. See ONYCHOPHORA.

Periphloëm. See PERICAMBIUM.

Periphoranthium. See PERICLINIUM.

Periphyllidæ. Family of *Peromedusæ*, including Jellyfish of complex structure, with twelve tentacles, of which four



Periphyllidæ (*Periphylia mirabilis*).

are interradial and sensory, and with sixteen marginal lappets, containing thirty-two pockets.

Periphyses. Sterile filaments of the nature of paraphyses, arising from the hymenium of certain *Fungi* at places where there are no asci.

Periplasm. Layer of hyaline protoplasm surrounding the oösphere in the oögones of *Oömycetes*, a sub-class of *Fungi.*

Periplast. See BLASTEMA.

Periplus. Voyage or circumnavigation. That of Hanno was along the w. coast of Africa to a point beyond the Senegal.

Periproct. Space surrounding the anus, especially in Echinoderms.

Peripteral. In Grecian Architecture, this denotes a temple entirely surrounded with columns.

Peripylæa. Order of siliceous *Radiolaria*, with a spherical structure to the central capsule which is uniformly perforated. The nucleus is single in the *Monocyttaria*, and double in the *Polycyttaria*. The sub-order *Sphærida* includes *Haliomma*, with the spherical skeleton partly in the central capsule. The sub-order *Discida* has the skeleton somewhat flattened; *Thalassacolla* has no connected skeleton. The *Polycyttaria* consist of colonies of Radiolarians fused by their extra capsular protoplasm, e.g. *Collosphæra*.

Perisarc. Chitinous envelope secreted about certain Hydroids.

Perischoëchinidæ. See TESSELLATA.

Periscopic. Eye-glasses when in the form of converging or diverging menisci. These were proposed first by Wollaston to replace the ordinary double convex and double concave lenses, because by this means a much wider range of vision is obtained: hence the name periscopic glasses.

Perisome. Integument of echinoderms.

Perisperm. See ALBUMEN.

Perisporangium. Indusium of ferns.

Perispore. In Algology, cell in which tetraspores are formed.

Perissad. In Chemistry, element whose valency is expressed by an uneven number.

Perissodactyla (ODD-TOED UNGULATES). Hoofed Mammals, having the middle toe or digit most developed and serving as the main support of the body. In all, the toes of the hind feet are odd in number, one or three digits being present (in *Coryphodon* five). When horns are present, they are never supported by a bony core, and are in the median line of the skull even when there are more than one. The stomach is not divided into compartments. There are never less than 22 dorso-lumbar vertebræ. The dentition is usually complete. A space is present between the incisors and premolars; the canines, when present, are developed, especially in the upper jaw of the males, into tusks. The families included are *Coryphodontidæ*, *Rhinocerotidæ*. *Tapiridæ*, *Brontotheridæ*, *Palæotheridæ*, *Macraucheniidæ*, *Equidæ*.

Peristaltic Motion. Action of the muscular coat of the intestines by which the contained substance is moved on regularly.

Peristerite. Variety of albite feldspar, showing a peculiar iridescence, similar to the colors on the neck of a pigeon; sometimes used as a gem-stone.

Peristeromorphæ. See COLUMBINÆ.

Peristoma. 1. Lip of the aperture (mouth) of snail-like shells. 2. Region around the mouth of animals, having a circumoral ring of cilia or of tentacles. It includes the space thus inclosed.

Peristome. Row or rows of hair-like processes, called teeth, surrounding the mouth of the sporange or capsule of certain mosses. These teeth are in number always some multiple of 4.

Peristyle. Inclosure of columns surrounding either a building or a vacant space. It is most commonly employed to denote a circle of columns, but is equally applicable to a rectangular arrangement.

Perithecium. Conceptacle which contains the asci in *Ascomycetes*, an order of *Fungi*.

Peritoneum. Serous sac covering the contents of the abdomen and lining the abdominal walls. Because of the diverse contents of the abdomen, it is the most complexly formed of all the serous sacs. Its use is to permit the proper movement of the various organs in the abdomen. See SEROUS MEMBRANE.

Peritonitis. Inflammation of the peritoneum; of many forms and from many causes. Acute peritonitis begins suddenly with agonizing pain. The sufferer lies on his back with shoulders raised and thighs flexed to relax the abdominal walls. The pulse is small and wiry, the abdomen tense and tympanitic. Physicians are divided as to the treatment: some insist upon free catharsis, others upon the free use of opium, and still others say an incision through the abdominal walls and local treatment is necessary. The probability is that all are correct, and skill is required to determine the proper treatment in the individual case.

Peritreme. Peristome of a Gastropod shell.

Peritricha. *Infusoria* with a circle of cilia around a disk, in the edge of which is a mouth leading into a pharynx. The opposite pole of the body is adapted for fixation. *Vorticella* is a typical example.

Perivisceral Cavity. Part of the body cavity that surrounds or contains the viscera.

Periwinkle. *Vinca minor.* Low, blue-flowered, trailing shrub of the natural family *Apocynaceæ*, blooming in early spring; native of Europe; much cultivated as an ornamental plant.

Periwinkle (LITTORINA). Medium-sized globular snail of sea-shores; it feeds on *Algæ*.

Periwinkle, PENNYWINKLE, WINKLE, WRINKLE (SYCOTYPUS). Large sea snail, with hairy epidermis; it sometimes destroys oysters.

Perizonium. Wall of the auxospore in Diatoms.

Periwinkle (*Vinca minor*).

Perizonius, or **Voorbroek,** JACOB, 1651–1715. Prof. Franeker 1681, Leyden 1693; writer on the classics. *Origines Babyloniæ*, 1711.

Perjury. Willful false swearing to evidence material to the issue in a legal action. The definition and punishment vary with the statutes of different jurisdictions.

Perkins, BISHOP W., 1841–1894. Judge 11th Dist. Kan. 1873–83; M.C. 1885–91; U. S. Senator 1892–93.

Perkins, CHARLES ALLEN, 1832–1892. U. S. Minister to Portugal 1869–70; married to a Spanish princess 1870; proscribed in Spain 1874.

Perkins, CHARLES CALLAHAN, 1823–1886. American writer on art. *Italian Sculptors*, 1868–83.

Perkins, ELI (MELVILLE D. LANDON), b. 1840. American humorist. *Eli Perkins* (*at large*), 1875.

Perkins, ELISHA, 1741–1799. Inventor 1796 of an alleged method of curing rheumatism by "metallic tractors," which was used in London, and caused much controversy; inventor also of an antiseptic drug for other diseases, which failed to save himself when tried for yellow fever.

Perkins, GEORGE HAMILTON, U.S.N., b. 1836. Lieut. 1861; distinguished at New Orleans and Mobile; Captain 1882.

Perkins, GEORGE ROBERTS, 1812–1876. American mathematician, author of widely-used text-books.

Perkins, JACOB, 1766–1849. American inventor of improvements in banknote engraving, and later of the bathometer, the pleometer, and the steam-gun. He was in England from 1818.

Perkins, JUSTIN, 1805–1869. American missionary in Persia from 1834; translator of the Bible into Syriac.

Perlitic Structure. Structure seen in some vitreous rocks. See PEARLSTONE.

Perm. City of e. Russia, on the Kama, at the mouth of the Joga Shika. It has extensive smelting works. Pop., 1890, 39,281.

Permanent Fortification. Defensive works erected during peace for the protection of vital strategical points, such as an important harbor, the capital of the State, or other point essential to the security of the State. They require the application of the highest development of the art of fortification, and are intrusted to the care of trained military engineers. In the U.S. the principal harbors on the Atlantic and Pacific coasts are permanently fortified, while in European States the frontiers and capitals are also necessarily cared for. The recent developments in artillery have greatly modified the character of these works and made obsolete the masonry structures which in 1860 were considered abundantly strong. In that day the 64 lb. solid shot could make but little impression upon the 8 ft. of granite wall, but the ton and a half shot of the 17-in. modern rifle demands great thickness of steel armor, or of earthen and concrete batteries to offer a reasonably secure protection to the modern armaments of defense.

Permanent Rank. The rank held by an officer in the permanent military establishment, as distinguished from that which the same person may hold temporarily in the volunteer army, or by assignment temporarily in the regular army, such as aides-de-camp, acting judge-advocates of departments, etc.

Permanent State. See CONDUCTION.

Permanent Way. Roadbed of a railroad, with its culverts, bridges, and track. The cost of construction for steam railroads has averaged ab. $30,000 per mile of single track. For electric railways the cost is about one-half as great, on account of the smaller amount of excavation and embankment.

Permanent White. See BARIUM SULPHATE.

Permanganates. Derivatives of permanganic acid.

Permanganic Acid. $HMnO_4$. Compound resembling perchloric acid; obtained in water solution by the decomposition of its salts when acted upon by sulphuric acid; good oxidizing agent; principal salt is POTASSIUM PERMANGANATE (q.v.).

Permian. Highest of the Palæozoic rocks; by some included in the Carboniferous. See COLUMN.

Permutation. Arrangement of elements in different orders. The number of possible permutations of n elements equals the product of the natural numbers from 1 to n (called factorial n), and is represented by placing n in a right angle $\lfloor n$, or by placing the exclamation mark after it, n!

Pernambuco. City and seaport of n.e. Brazil. It consists of three sections: Recife, founded by Spaniards ab.1580, and

Street View in Pernambuco.

San Antonio and Boa Vista, settled by the Dutch 1639 and taken by Portuguese 1654. It has an extensive commerce in sugar, cotton, and hides. Pop. ab. 140,000.

Peromedusæ. Order of *Scyphomedusæ*, having four interradial sensory tentacles, four pairs of band-like reproductive glands fixed to the wall of the sub-umbrella and projecting into a wide ring-canal, and the wide perradial stomach pouches. See PERIPHYLLIDÆ.

Peromela. See GYMNOPHIONA.

Peronosporaceæ. Order of minute *Fungi* (mildews), of the sub-class *Phycomycetes*, existing parasitically on living green plants. The well-known and destructive potato-rot is of this order.

Peropoda. The Old World *Pythonidæ* and New World *Boidæ* (Boas and Anacondas) are included. The Pythons have a long oval head, two rows of subcaudal plates and pitted labial plates. They live near water, hanging from limbs by the prehensile tail, and feed on small mammals; none larger than a goat can be swallowed by the largest Python. The bones are first crushed; the deglutition lasts a long while. Large animals are sometimes killed in the coils of these monsters, whose length ranges from 10 to 25 ft., although fabulous stories are told of Pythons more than 40 ft. long. The female Python incubates its eggs for three months, the temperature within the coils rising to 96° F. The *Boidæ* have broader frontal bones, subcaudal plates entire, the labial plates usually not pitted; otherwise they resemble Pythons, like them having rudiments of hind feet near the cloaca. The Boa-constrictor

Python (*Python natalensis*).

of Brazil has one row of large oval pale spots on the back, while the Anaconda has a double series of dark spots on the back. See AGLYPHODONTA.

Perowne, JOHN JAMES STEWART, D.D., b. 1823 in India. Prof. Cambridge 1875, Dean of Peterborough 1878, Bp. of Worcester 1891; O. T. reviser. *Psalms*, 1864–68.

Peroxide of Hydrogen. See HYDROGEN DIOXIDE.

Perpendicular Fortification. Devised by Montalembert ab.1776; succession of salient and reëntrants, the sides of the latter being perpendicular to each other. Covering these were low counterguards and ravelins, and within were brick towers; seen in German defensive works, which now are of lessened importance.

Perpendicular Gothic. Term applied to the latest phase of mediæval architecture in England. It is derived from the fact that the windows at this period were subdivided by numerous upright mullions, and especially that the tracery of the window-heads, which in previous periods had been composed of flowing and curved lines, consisted also of their mullions and of the lancets they inclosed. A like series of panels was in many cases applied to the buttresses and other exterior features, and to some part of the walls next to the vaults, for ornament, while pointed doorways were inclosed in square frames, and the spandrils were richly decorated. This declining phase of the style prevailed from the middle of the 14th century to the end of Henry the Eighth's reign in 1547, the succeeding architecture, in which classic forms began to appear, being known as Elizabethan, Jacobean, etc. English collegiate Gothic is for the most part perpendicular. New College, Merton College, the Divinity School at Oxford, Henry the Seventh's chapel at Westminster, the College chapel at Cambridge, and interior of Winchester Cathedral are familiar examples of the style.

Perpendicularity. Two straight lines given by their equations are perpendicular when the product of their slopes equals minus one. $y = mx + b$ and $y = m^1x + b^1$ are perpendicular when $m.m^1 = -1$. Two planes given by their equation are mutually perpendicular when the sum of the products of their corresponding direction vectors equals zero. $Lx + My + Nz + P = 0$ and $L^1x + M^1y + N^1z + P^1 = 0$ are perpendicular if $LL^1 + MM^1 + NN^1 = 0$.

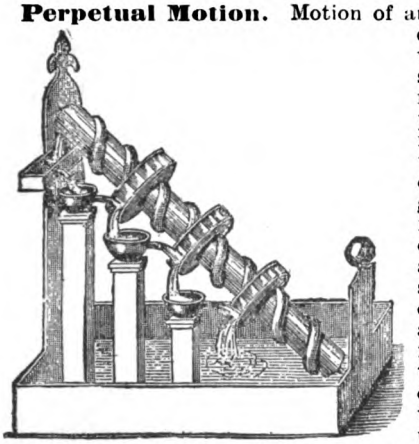
Perpendicular Lines. Lines are mutually perpendicular when their difference of direction is ninety degrees. A straight line is perpendicular to a plane when it is perpendicular to all lines of the plane through its foot.

Perpendicular Planes. Two planes are mutually perpendicular when their angle of intersection is a right dihedral.

Perpent Stone. Stone reaching through a wall so as to appear on both sides of it. The name Bond-stone is used in rough walling.

Perpetua, ST. Martyr at Carthage 203. See FELICITAS.

Perpetual Motion. Motion of any machine which, independent of wear, would not cease; self-sustained, continuous mechanical motive-power. A ball always rolling or a wheel always turning, each operating, *e.g.*, by gravity alone, would fulfill the necessary conditions. Inasmuch as friction between surfaces in contact can never be entirely avoided, it is clear from the principle of the conservation of energy that all attempts to solve this problem are sure to fail. In Bishop Wilkins's third apparatus, shown in the cut, the water-wheels turn the Archimedean screw, which elevates the water to the tank above.



Perpetuity. Settlement of an interest in property which shall go in the succession prescribed, without any power of alienation; generally prohibited beyond a life or lives in being at the time of its creation and 21 years afterward.

Perpignan. Old town of s. France, near the Mediterranean and the Pyrenees; held by Aragon 1172–1475, and by Spain 1493–1642. Pop., 1890, 27,613.

Perradial. See RADIAL SYMMETRY.

Perrault, CHARLES, 1628–1703. French author, famous by his fairy tales 1697. *Parallel of Ancients and Moderns*, 1688–96.

Perron. Flight of exterior steps leading to a platform, but employed only with reference to structures of considerable magnitude and pretension.

Perrone, GIOVANNI, 1794–1876. Jesuit theologian, prof. at Rome 1823–53. His *Prælectiones Theol.*, 9 vols., 1835, is widely used.

Perronet, EDWARD, 1721–1792. English hymnist; author of *All Hail the Power of Jesus' Name*, 1780.

Perrot, GEORGES, b. 1832. Explorer in Asia Minor 1861; prof. Paris 1863; historian (with C. Chipiez) of ancient art, 1881–89.

Perry. Drink resembling cider, but made from pears; much used in England; it contains from 5 to 9 per cent of alcohol.

Perry, ARTHUR LATHAM, D.D., LL.D., b. 1830. Prof. Williams Coll. since 1873. *Political Economy*, 1865–77.

Perry, NORA, 1841–1896. New England poet.

Perry, OLIVER HAZARD, U.S.N., 1785–1819. Lieut. 1807; commanding on Lake Erie 1813; famous for his defeat and capture of six British vessels near Put in Bay, Ohio, Sept. 10, and for his laconic dispatch, "We have met the enemy and they are ours."—His brother, MATTHEW CALBRAITH, U.S.N., 1794–1858. Commodore 1841, commanded an expedition to Japan 1853, and there negotiated or compelled a treaty March 1854. *Report*, 3 vols., 1856.

Perry, THOMAS SERGEANT, b. 1845. American author. *Francis Lieber*, 1882; *Opitz to Lessing*, 1885.

Perry, WILLIAM STEVENS, D.D., LL.D., D.C.L., b. 1832. Bp. of Iowa 1876. *Hist. American Episcopal Ch.*, 1885.

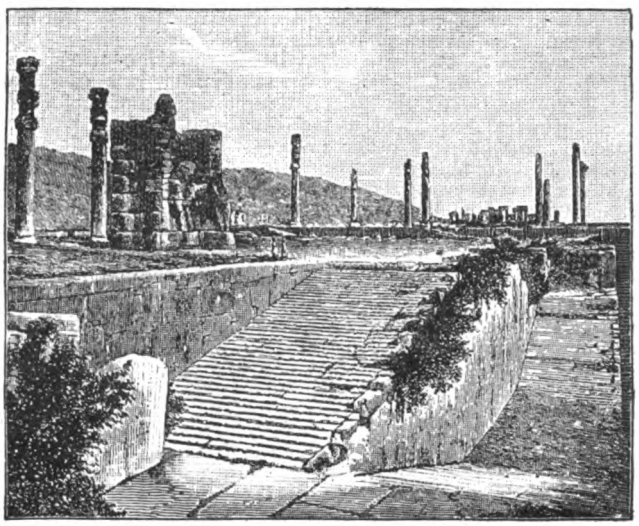
Perryville. Village of Boyle co., Ky.; scene of an indecisive battle Oct. 8, 1862, between Unionists under Buell and Confederates under Bragg. Each lost nearly 5,000.

Persecutions, TEN. Somewhat arbitrarily defined as under Nero 64, Domitian 95, Trajan 107, Hadrian 125, M. Aurelius 165, Sept. Severus 202, Maximin 235, Decius 249, Valerian 257, and Diocletian 303. The last was by far the most severe and continuous; yet in amount of blood shed and misery inflicted, all these pagan harryings of the Church were probably far inferior to the Christian persecutions which raged 1200–1600, especially the Albigensian crusade, the Spanish Inquisition, and the efforts of Charles V. and Philip II. to suppress heresy in the Netherlands.

Perseids. Meteoric showers having the radient in the constellation Perseus. They appear ab. Aug. 1.

Persephone. Greek name of PROSERPINE (q.v.).

Persepolis. Capital of ancient Persia, ab. 35 m. n.e. of the modern Shiraz. Enormous masses of ruins, especially of palaces, still mark the spot. Chief among these were the Great Hall of Xerxes, his palace, and that of Darius. Their reliefs and other sculptures show a generally Assyrian quality and influence, but the forms of many buildings are distinctly Egyptian. Greek influences are also apparent in the ornamental details. P. is not mentioned before the Macedonian conquest: its original name is unknown. The palace, if not the city, is said to have been burned by Alexander 331 B.C.



Great Staircase to Northern Platform, and Propylæa of Xerxes; Great Hall of Xerxes and Palace of Darius in the distance.

Perseus. Argive hero, son of Zeus and Danæ; slayer of Medusa; liberator of ANDROMEDA (q.v.); King of Thessaly; widely honored; depicted like Hermes.

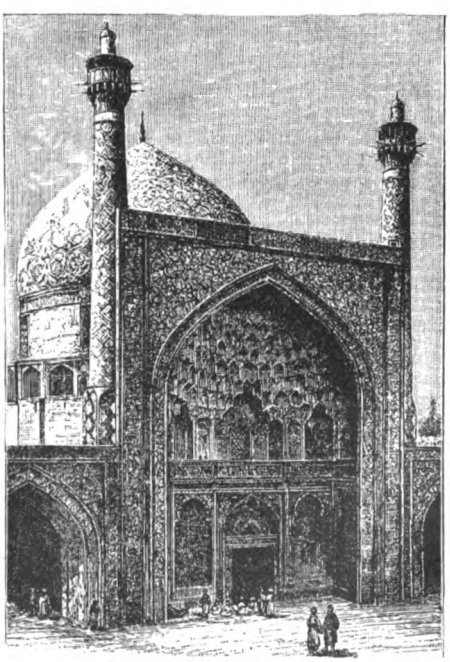
Perseus, ab.212–ab.163 B.C. Son of Philip V. of Macedon; King 179; at war with Rome 172, and successful against Crassus; defeated by Æmilius at Pydua 168. His kingdom was annexed, and he died a captive.

Perseus. Constellation of the northern heavens. Mean right ascension, 3h. 20m.; mean declination, 45°.

Perseverance of Saints. Doctrine that the elect cannot fall from grace and must finally be saved. It is an essential point in the theology of Augustine and Calvin.

Persia. Country of w. Asia, consisting for the most part of a desert table land, 3,000 to 4,000 ft. high, crowned by mountain ranges. Area ab. 636,000 sq. m., pop. ab. 9,000,000, one-fourth wandering tribes. The products are wheat, barley, rice, opium, tobacco, hides, wool, silk and carpets. The government is a despotic monarchy. See PERSIAN EMPIRE.

Persian Architecture. Architecture of ancient Persia took on monumental proportions and pretensions after the conquests of Cyrus and Cambyses in the 6th century B.C. The elements of which it was composed were imported from



Gateway of the Great Mosque of Ispahan.

Egypt and Assyria, and the monuments follow in their general arrangement the plans of these, while the details in some cases are with difficulty distinguished from those of the Assyrians. The principal remains of Persian architecture are at Persepolis and Susa. The Palace of Xerxes at the former place is the most important. This was built early in the 5th century B.C., and its dimensions were 300 by 350 ft., making it larger than any Egyptian, Greek, or Roman temple, and than any European cathedral except St. Peter's in Rome. It was built of masonry, as were the other principal Persian buildings, of which a striking feature was the extensive and massive flights of stairs that served as approaches. The interior columns were lofty and slender, and the forms of their capitals indicated wooden originals. Their interest is upon the whole rather archæological than artistic. In addition to the palace there are extant ruins of small temples and rock-cut tombs.

Persian Art. Best illustrated, for antiquity, by the remains at PERSEPOLIS and SUSA (q.v.). The earliest known ruins will not antedate 500 B.C. At this time the Persian art may be considered as a continuation of the earlier Chaldean and Assyrian with some national modifications. Egyptian influences are also very apparent, and are due to the political connection of Egypt with Persia. A later period of Persian art is known as Sassanian, from the dynasty founded 218. This art is a bastard classic, and represents influences which had been ascendant ever since the time of Alexander's conquest of the Persian empire. After the Mohammedan conquest, 7th century, such traits of the Arab style and art as had been elsewhere developed came into play here also; but the Sassanian or bastard Greek quality still survives in modern Persian designs, especially in repoussé metals. This quality does not, however, appear in the textiles, which are a most important and splendidly developed industrial art, handed down to modern times in direct continuation from a very early antiquity, when Babylonia was a famous neighboring center for textiles. The Arabian influence was most apparent in ceramics and in tiles. Here again the older Persian traditions in the art of glazing had great importance. The finest surviving instance of ancient tile decoration is that in the Louvre, from Susa.

Persian Berries. Dried unripe fruit of different varieties of *Rehamnus*, used as a dye in calico printing. They are also called French berries, Arigum, and Yellow berries. They dye yellow and green.

Persian Empire. This dates from Cyrus' revolt against and conquest of the Medes 558 B.C. Babylonia and Assyria were soon added. Asia Minor was conquered ab.547. Cambyses, 529–522, subjugated Egypt and n. Africa. For 200 years Persia was the chief power of the world. The expeditions against Greece under Darius 490, and Xerxes 480, resulted disastrously. Cyrus the younger died in an attempt to dethrone his brother Artaxerxes 401. The empire ended with Alexander's victory at Gaugamela 331. Persia was subjugated by Parthians 248 B.C. The Sassanian empire began 212; under Sapor II., 310–379, and Chosroes II., 590–628, it became a formidable power and threatened Constantinople. It was conquered by Saracens 641; by Seljuks in 12th century, by Mongols in 13th, by Tamerlane in 14th.

Persian Gulf. Land-locked sea between Persia and Arabia, connected with the Indian Ocean by the Strait and Sea of Ormuz. Length 650 m., width ab. 250.

Persian Inscriptions. See CUNEIFORM WRITING.

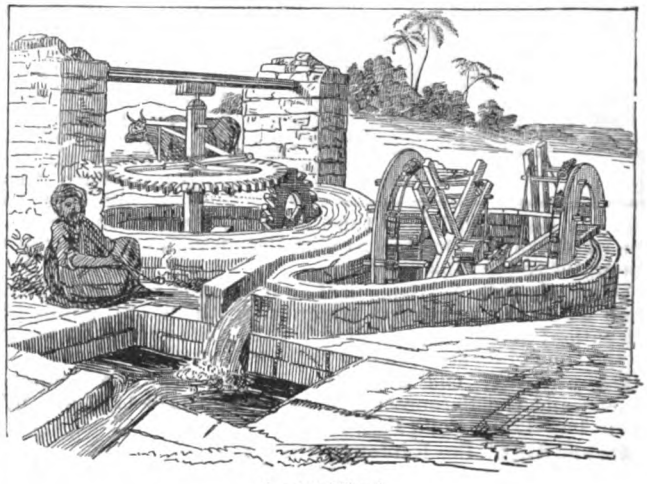
Persian Language. One of the oldest Aryan families of speech, with inscriptions dating back to 500 B.C., and a literature headed by the Avesta, the sacred books of the religion of Zarathustra. The Parsees of India spoke another dialect of the same. Modern Persian has many words borrowed from the Arabic. See IRANIAN LANGUAGE.

Persian Literature. It began ab. 5th century. Under the Mohammedan caliphs and princes it flourished at Khorasan and elsewhere. Abbas at Merv is said to have written the first poem 809. Arabic literature hindered the growth of the Persian, but a succession of writers handed down the literary spirit. Firdausi in 1011 completed the *Shâh Nameh*, which Sir William Jones compared to Homer. Around this "Book of the Kings" cluster a series of epics. Romantic fiction also was developed, Nizami of Ganjah (1141–1203) being its most brilliant exponent. Of the poets, Omar Kharyam was noted. Innumerable writers have composed works in various departments, and Persian has found many champions and devotees in India, at the courts of the Mogul sovereigns. The principal authors have been mentioned individually elsewhere.

Persian Powder. See PYRETHRUM.

Persians. The Tajiks are the descendants of the true ancient Persians who were Caucasians: they number ab. 1,000,000. They are mostly Mohammedan. The Turcomans, Kurds, and Arabs are nomadic, and number 2,000,000. There are 25,000 Nestorian Christians. A sharp distinction is recognized of classes: Priests, officials, soldiers, merchants, artisans, etc. Several Mohammedan sects have developed, among whom the Babist is highest. The descendant of pure Persian blood is generally honest and superior to others. Four wives are allowed the Mohammedans. In character the people are sensual, love money, dress, and ceremony. See PARSEES.

Persian Wheel. Horizontal wheel for raising water, having buckets attached to its arms, which fill themselves at



Persian Wheel.

one part of the revolution and when higher up are emptied. It is used for irrigation in Oriental countries, being turned by bullocks.

Persico, IGNAZIO, 1823–1895. Italian Capuchin 1846; missionary in Asia 1852, and in S. C. 1867; Bp. of Savannah 1870–73; Prefect of the Congregation of Indulgences; Cardinal 1893.

Persigny, JEAN GILBERT VICTOR FIALIN, 1808–1872. Bonapartist, accomplice of Louis Napoleon in the attempts at Strasburg and Boulogne; imprisoned 1840–48 for the latter; Deputy 1849; Minister of the Interior 1852–54 and 1860–63; Ambassador to London 1855–60; Duke 1863. *Mémoires*, 1896.

Persimmon. Trees of the genus *Diospyros*, of the ebony family (*Ebenaceæ*), bearing pulpy edible fruits, natives of America and Asia. The e. N. American species is *D. virginiana*, known as Date Plum.

Persistent. Leaves which remain on a plant during two seasons, or until the appearance of new ones, as in Evergreens; also portions of the perianth of flowers which remain after anthesis.

Persius, or AULUS PERSIUS FLACCUS, 34–62. Third in the series of Latin satirists, though more nearly allied to his successor, Juvenal, than to Horace. But 650 lines, in six satires, remain, which show his high views and earnest purposes. He affected obscurity of style, but lashed the vices of the times severely.

Person. 1. Totality of the human organism and the states connected with it, coextensive with body and mind. 2. Subject or ego, conceived as possibly other than the body. In common parlance, synonym for individual.

Personal Capital. PERSONAL WEALTH (q.v.) as capable of reproductive use.

Personal Equation. That constant which, in any series of time observations made by one person, must be added to each term of the series in order that their mean shall agree with the mean of a similar series of observations made by another. Used first and principally in astronomy, where, *e.g.*, if two observers are watching the same series of events, as the passing of a series of stars over the same line marked in the telescope, it is almost invariably found that one observer has a tendency to note the times of passage later than the other, and that with approximate constancy, so that to combine the observations of the two it is necessary to determine the mean of the differences in the one observer and add this mean to the observations of the second, in order to make those of the first what they would have been if observed by the second, or approximately so. The term has now come to be used to designate any constant tendency to error which is peculiar to the observer or worker, and for which allowance can be made. Most noticeable in transit observations, and, although gener-

ally small, may in extreme cases be as large as half a second. In case of the noted astronomers, Bessel and Struve, the relative personal equation, *i.e.*, the difference between the times of transit of the same star observed by each, was a whole second. See PSYCHOMETRY.

Personal Equation Machine. Various forms of apparatus have been devised for determining the personal equation. They generally consist of an artificial star passing across a field like that of the transit instrument, recording its time of transit automatically by electric appliances. The difference between this time and that noted by the observer is his personal equation. Any constant error in the automatic record may be eliminated by causing the star to move back and forth across the field.

Personality. Distinguishing individuality of a person. Its most distinctive element is the conscious realization of identity. All one's mental life goes to make up his personality, the traces of past experiences associated and remembered, his interests, etc. So long as this consciousness of personal identity remains undisturbed, the personality is normal; but it has been shown by many cases of mental disorder that this consciousness may be pathologically deranged, and we have as a result the so-called alterations of personality, or dual or multiple personality. These conditions are best seen in certain hypnotized hysterics, in whom it is found that certain symptoms and sets of ideas exist for but one consciousness, if we may use that term, while the subject may pass into another condition or state, where he has quite another world of ideas and experiences, those of this second state being non-existent for the first; and similarly if there be a third personality, it will include the experiences of the first and second, plus a series of its own, and the first and second states will know nothing of the third. In non-hypnotic cases the second personality may appear, last for a time, and then give way to the original or normal condition, though this may be of inferior physical and intellectual type to the abnormal state. The physical basis of these disturbances of personality is not understood. Alternating action of the two hemispheres of the brain has been suggested, but will not satisfy the facts of triple and quadruple personalities, and no other satisfactory theory is at hand.

Personal Property. That which is not of a freehold nature nor descendible to heirs at law.

Personal Risks, IN ECONOMICS. Business risks which a man working with borrowed capital has to bear, and pay for in the form of a higher rate of interest, in addition to the ordinary trade risks borne also by the man working with his own capital.

Personal Wealth. All those energies, faculties, and habits which directly contribute to making a person industrially efficient, together with his business connections and associations of every kind.

Personate. Corollas of certain plants of the natural family *Scrophulariaceæ* and some others, which are nearly closed by the palate of the lower lip.

Person, RIGHTS OF THE. Rights of safety, security and free agency, requisite for the peace of society and the free action of individuals; in all civilized countries guaranteed by the laws.

Persoon, CHRISTIAN HENDRIK, 1755–1837. Dutch botanist. *Synopsis methodica fungorum*, 1801; *Synopsis plantarum*, 1805; *Traité sur les champignons comestibles*, 1818; *Mycologia Europæa*, 1822–28.

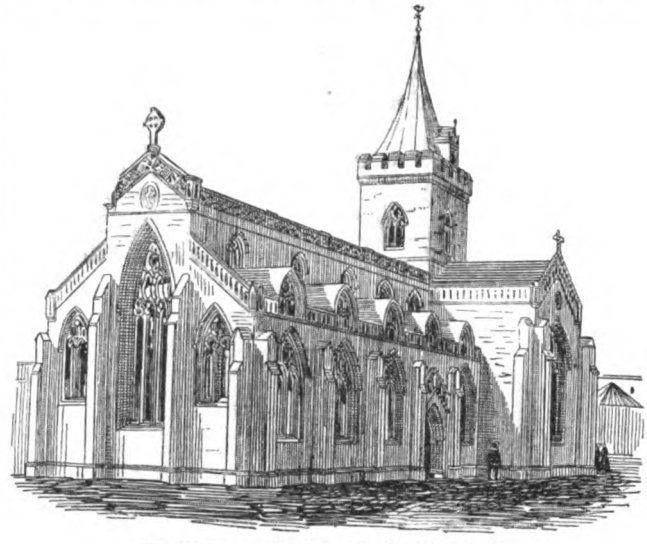
Perspiration. The secretion of the perspiratory glands, a clear, watery liquid having an acid reaction and a salty taste. It contains 0.5 to 1.25 per cent non-volatile constituents, consisting mostly of sodium chloride, with lactates, butyrates, and acetates of ammonium and sodium, and traces of calcium phosphate and ferric oxide. It removes waste material from the system, and, by the evaporation of the water, cools the body, maintaining the normal temperature. The amount of water exhaled from the skin of an adult in 24 hours is ab. 2 lbs., twice the amount passing off from the lungs; the maximum is 3.4 lbs., the minimum 0.7 lbs.

Perspiratory Glands. Apparatus to secrete the PERSPIRATION (q.v.). A minute tube coiled into a ball in the deep part of the skin and continued in the perspiratory duct to the surface of the skin.

Persulphocyanogen. $C_3N_3S_3H$. Yellow powder, formed by oxidizing potassium sulphocyanide with nitric acid or chlorine; insoluble in water. Used as a yellow pigment in calico printing.

Persulphuric Acid. Normal sulphuric acid, $S(OH)_6$ or $H_2SO_4+2H_2O$; formed by the action of water on sulphuric acid.

Perth. Town of Scotland, on the Tay, 22 m. w. of Dundee. Here James I. was murdered 1437: near it Montrose



The Church of St. John the Baptist, Perth.

won a victory 1644. P. is noted for its bleach-fields, 4 m. outside of the city. Pop., 1891, 30,525.

Perth. Capital of Western Australia; on the Swan, 12 m. from the w. coast; incorporated 1856. Pop., 1892, 10,040.

Perth Amboy. City of Middlesex co., N. J., on Raritan Bay; chartered 1784. It has terra-cotta works and other industries. Pop., 1890, 9,512.

Perthes, BOUCHER DE. See BOUCHER DE CRÉVECŒUR DE PERTHES, JACQUES.

Perthes, FRIEDRICH CHRISTOPH, 1772–1843. Publisher at Hamburg 1796, and Gotha from 1821.—His uncle, JOHANN GEORG JUSTUS, 1749–1816, founded another important publishing house at Gotha.

Perth, FIVE ARTICLES OF. In the Episcopal interest; urged by James VI. 1618; condemned by General Assembly 1638.

Perticari, GIULIO, COUNT, 1779–1822. Italian critic.

Pertinax, PUBLIUS HELVIUS, 126–193. Roman general of high character; Emperor Dec. 192; murdered by Prætorians after a reign of 87 days.

Perturbations OF PLANETS AND COMETS. Disturbances in their motions caused by the attraction of bodies other than the sun or central body, about which they revolve.

Pertz, GEORG HEINRICH, 1795–1876. Keeper of archives at Hanover from 1823; biographer of Stein, 1849–54. *Monumenta Germaniæ Historica.*

Peru. Country of w. S. America. The surface consists of a narrow desert strip along the Pacific, a high tableland, 7,000 to 12,000 ft. above sea, inclosed between two ranges of the Andes, and a low, densely forested country on the east, upon the headwaters of the Amazon. The second of these areas contains most of the settled portion. Its area is ab. 400,000 sq. m. Its mineral wealth is very great. The government is a republic. The capital is Lima. For centuries before the Spanish conquest P. was occupied by the Incas, who had reached a stage in many respects in advance of its Spanish conquerors. They had an elaborate religious ritual, a well-developed system of colonization and land tenure, postal facilities, a written history, and a drama. Their architecture was of an elaborate order: their skill in stone-cutting and joining is said to be unsurpassed. The Spanish conqueror, Pizarro, came 1527 in search of gold. After obtaining the title of Governor he returned 1529. Taking advantage of a civil conflict between two sons of the Inca, who had just died, he, by allying himself with one of them, established himself in the empire, marched to the capital and proclaimed the sovereignty of Spain. P. thus became one of the four principal Spanish dependencies in the New World. In the attempt of the S. American countries to throw off the Spanish yoke P. was the last to join. She declared her independence 1821. Bolivar was Dictator till 1827, when Bolivia was detached from P. P. has been involved in several civil wars, and twice, 1837 and 1879, in wars with Chili, the last of which proved disastrous to the political and commercial prosperity

of P. Her navy was destroyed, her capital pillaged, and her territory much curtailed. Its products are sugar, wool, cotton, cinchona bark, silver and copper. The guano deposits of its islands are exhausted. Pop. ab. 3,000,000.

Perugia. Ancient Etruscan city, on the Tiber, 127 m. n. of Rome; taken by Romans 310 B.C., and by Goths 549. Its university, founded 1307, has 21 instructors and ab. 180 students. The city has many fine buildings, pictures and antiquities; 11 m. w. is Lake Trasimeno (now P.) where Hannibal overthrew a Roman army 217 B.C. Pop., 1893, 54,500.

Perugino (PIETRO VANNUCCI), 1446–1524. Italian painter of the Umbrian school. Long reputed the teacher of Raphael. Although Giovanni Morelli has vindicated the claims of Timoteo della Vite to this distinction, the affinities between the early art of Raphael and that of P. are still obvious. His works

Decoration of the Cambio, Perugia, by Perugino.

are mainly altar-pieces; an important fresco is in the Sistine Chapel at Rome. His color is warm, his composition somewhat formal, as was common in his earlier time.

Perules. In Botany, bud-scales.

Peruvian Balsam. Fragrant oleo-resin obtained from *Myroxylum pereirœ* of San Salvador; used in medicine in respiratory affections and as a stimulating ointment. It is also used in the manufacture of perfumery and soaps.

Peruvian Bark. Bark of numerous species of the genus CINCHONA (q.v.), natural family *Rubiaceæ*, natives of the Andes; extensively cultivated, yielding quinine, cinchonine, and a variety of other alkaloids. *C. calisaya* and *C. succirubra* contains 2–5 per cent of quinine; *C. ledgeriana* has 11 per cent. It was made known in Europe, 1639, by the Countess of Cinchon, wife of a gov. of Peru; used in England 1658; called also Jesuits' Bark, as the Jesuits introduced it in Italy. See QUININE.

Peruvians. For ancient Peruvians, see INCAS. Their modern descendants are the QUICHUA (q. v.). The Aymara number ab. 750,000; two-thirds live in Bolivia. They inhabit the mountain fastnesses; it is supposed that their ancestors were civilized earlier than the Incas, the ruins in Lake Titicaca being their work. They are more closely related to the Quichua than to the other mountain tribes. Among the latter is a group of tribes known as the Jivaro, among whom the couvade is practiced, and cannibalism is reported to exist. The Campo is the largest tribe, but, like the others, are degenerated from ancient condition. They bury their dead under water. The Mojo were largely Christianized, but have relapsed since the Jesuits were driven out. The tribes on the east slope of the Andes belong to the TUPI-GUARANI (q.v.) group of Indians.

Peruzzi, BALDASSARE, 1481–1536. Italian architect and painter of the great period. He designed the Farnesian Villa and the Palace Massimi at Rome, and had charge of the work on St. Peter's 1520–27.

Peruzzi, UBALDINO, 1822–1891. Deputy and Syndic of Florence; Cabinet Minister 1861 and 1864.

Pervigilium Veneris. Anonymous Latin poem in honor of Venus.

Pes. Human foot, or hind foot of lower animals.

Pesado, JOSÉ JOAQUIN DE, 1801–1861. Mexican poet; Minister of State 1838 and 1846; prof. Univ. Mexico 1854.

Pescadores Islands. Group of 21 islands besides uninhabited rocks in Formosa Channel, of basaltic origin, 109 m. s.e. of Amoy; dangerous to navigators; ceded by China to Japan 1895.

Peschiera. Fortified town of Italy, at the foot of Lake Garda, 14 m. w. of Verona. Before 1860 it formed the n.w. angle of the QUADRILATERAL (q.v.). Pop. 2,000.

Pesellino, FRANCESCO, 1422–1457. Florentine painter.

Peshawar. City of the Punjab, British India, near the river Kabul and the Khyber Pass, among high mountains; important military station. Pop., 1891, 84,181.

Peshito. Syriac version of O. T. and most of N. T.; dating from ab. 200.

Pessard, HECTOR, 1836–1895. French journalist, vehement against Napoleon III.

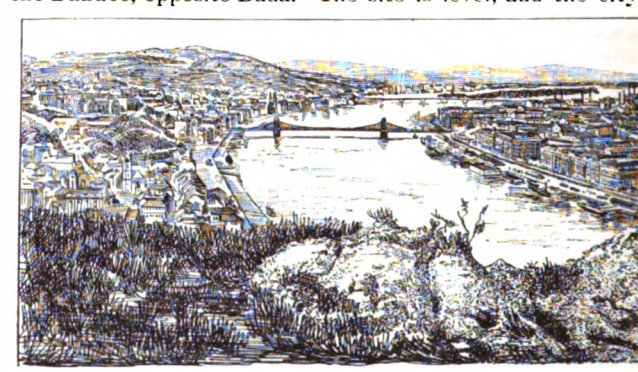
Pessimism. Theory that the nature and tendencies of things are only evil; opposed to Optimism. Its most eminent expounders are Schopenhauer and Hartmann. In practical ethics, tendency to look on the dark side of life, exaggerating its evils and neglecting its goods.

Pessinus. City of w. Galatia, on the Sangarius; noted for a temple and statue of Cybele, whose worship for a time made the town rich and prominent.

Pessulus. Vertical partition between the two bronchial openings in the syrinx.

Pestalozzi, JOHANN HEINRICH, 1745–1827. Swiss teacher and theorizer, head of a school at Yverdun 1805–25; an impractical philanthropist, whose ideas have revolutionized modern educational methods. *Hours of a Hermit*, 1780; *Leonard and Gertrude*, 4 vols., 1781; *How Gertrude Teaches*, 1801.

Pesth. Capital of Hungary, situated on the left bank of the Danube, opposite Buda. The site is level, and the city is



Buda-Pesth, from the Gellerthegy.

regularly laid out, with many fine buildings. It has large manufactures and trade. Pop., with BUDA (q.v.), with which it was united 1873, 452,907 in 1889.

Petal. Division of the corolla of a flower.

Petalite. $LiAlSi_4O_{10}$. Lithium aluminium silicate; mineral in which lithium was first discovered.

Petalode. Organs resembling petals.

Petalody. Metamorphosis of other floral organs into petals.

Petaloid. Resembling petals: colored upper leaves or bracts of certain plants, and sepals or stamens of others, when these are so modified as to simulate petals in appearance, as in Poinsettia and the Dogwood.

Petaloid Ambulacra (CIRCUMSCRIPT ZONES). Ambulacral lunules, when present near one pole only, as in irregular sea-urchins. In a typical or regular sea-urchin the Ambulacra extend from pole to pole.

Petalosticha. See SPATANGOIDEA.

Petard. Case of gun-metal, often bell-shaped, containing 10 to 20 lbs. of gunpowder, used for destroying drawbridges, gates, etc., as by Henry IV. at siege of Cahors, 1580; now obsolete, its place being taken by powder-bags, dynamite cartridges, etc.

Petau, DENIS. See PETAVIUS.

Petavius, DIONYSIUS (DENIS PETAU), 1583–1652. Jesuit theologian, prof. Paris 1621–46; voluminous writer. *De Doctrina Temporum*, 1627; *Tabulæ Chronologicæ*, 1628; *De Theologicis Dogmatibus*, 5 vols., 1644–50. He edited Synesius and Epiphanius, and wrote against Grotius.

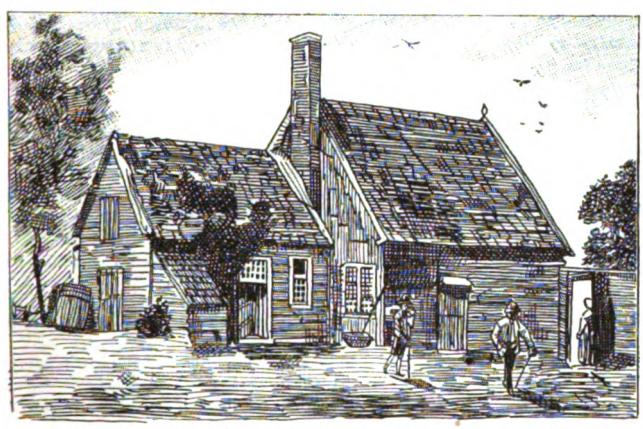
Petchora. River of n. Russia, heading in the Ural Mts., and flowing into the Arctic Ocean. Length 1120 m., drainage area 117,996 sq. m.

Pet Cocks. Small plug cocks, opening into the air from some vessel in which there is a different pressure from that outside; originally cocks put upon the connection to the air-chamber of the feed pump on a locomotive, so that the hot water might be expelled through them which leaked into it, and by its vaporization prevented the barrel from filling from the suction. These cocks are still used on locomotives which pump their feed. The use has been extended so that the term now covers any small cock which can be opened to blow out air or water to waste into the atmosphere.

Petechiæ. Small punctate extravasations of blood under the epidermis, resulting from various diseases; *e.g.*, scurvy.

Peter, ST. One of the Apostles; Galilean fisherman. At first usually the spokesman of the Twelve; less prominent after the rise of James among the Jewish and Paul among the Gentile Christians. Supposed to have been crucified at Rome ab. 67. His first Epistle, 21st N. T. book, was written, probably, after 60, from Babylon (possibly Rome), to the churches of Asia Minor. The second epistle is less certainly authentic. His Gospel and Revelation are apocryphal: fragments remain.

Peter I., "THE GREAT," 1672–1725. Emperor of Russia 1682; sole ruler from 1689. He studied navigation and shipbuilding, living in Holland and England 1697–98. His reign was marked by extensive reforms, some cruelties, the founding of St. Petersburg 1703, and wars with Sweden 1700–21, and Persia 1722, which added several provinces to his dominions. A war with Turkey, 1711, was disastrous. Of his grandsons, PETER II., 1715–1730, was Czar from 1727, and PETER III., 1728–1762, was murdered after reigning six months.



Peter the Great's House at Zaandam, Holland (on the left).

Peterborough, CHARLES MORDAUNT, EARL OF, ab. 1658–1735. Lord of the Treasury and Earl 1689–90; imprisoned January–April 1697; commander in Spain 1705–7, where he won great fame by a brilliant campaign, and by his capture and defense of Barcelona.

Peter de Vincis, d. 1250. Chancellor of Frederic II.; author of a code of laws proclaimed 1213.

Peterloo Massacre. In St. Peter's Field, Manchester, Aug. 16, 1819, a crowd of laborers assembled to petition Parliament for a redress of grievances. They were dispersed by cavalry; some were killed and many injured. This was the starting point of modern reform agitation.

Petermann, AUGUST, 1822–1878. German geographer; in Gt. Britain 1845–54; ed. *Mittheilungen* from 1854.

Peter Martyr, d. 1252. Italian Dominican, killed by a mob; patron and model of the Inquisition.

Peter Martyr. See VERMIGLI.

Peter Martyr Anglerius, 1459–1525. Spanish priest and writer. *De Orbe Novo*, 1516.

Peter Out. To grow gradually thinner and thinner, and finally to disappear altogether, especially in relation to mineral veins.

Peters, CHRISTIAN AUGUST FRIEDRICH, 1806–1880. Assistant at Hamburg Observatory 1834–39; connected with that at Pulkowa 1839–49; Prof. of Astronomy at Königsberg 1849; director of observatory at Altona 1854, and from 1872 at Kiel; ed. *Astronomische Nachrichten*.

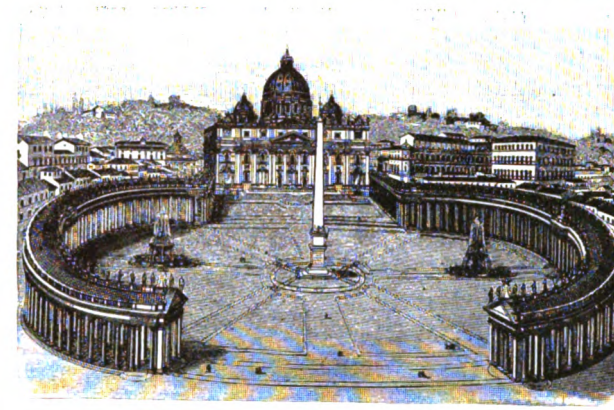
Peters, CHRISTIAN HENRY FREDRICK, 1813–1890. Born in Sleswick; graduated at Berlin. Prof. Hamilton Coll. and Director of Litchfield Observatory, Clinton, N. Y., from 1858. Here he constructed a series of excellent maps of zodiacal stars, observed many thousands of sun spots, and discovered 52 asteroids, besides many comets and variable stars.

Peters, HUGH, 1599–1660. Minister at Salem, Mass., 1636–41; Chaplain in Parliament's army; executed as a regicide.

Peters, RICHARD, LL.D., 1744–1828. Sec. to Board of War 1776–81; Delegate to Congress from Pa. 1782–83; U. S. District Judge from 1792. *Admiralty Decisions*, 1807.—His son, RICHARD, 1780–1848, pub. *Condensed Reports of U. S.*, 1830–34; *U. S. Digest*, 1838–39, and other reports.

Peters, SAMUEL, 1735–1826. Romancing historian of Conn. and its "blue laws." *General History of Conn.*, 1781; *Hist. of Hugh Peters*, 1807. See BLUE LAWS.

Peter's, ST. At Rome; largest church in the world; 613 ft. long, 450 ft. wide in the transept, with a façade 368 ft. long and 145 ft. high. The dome is 195½ ft. in diameter, and rises 435 ft. from the pavement. It stands on the site of a basilica built by Constantine on the spot where, according to tradition, St. Peter suffered martyrdom. The replacing of the old basilica was begun 1450; the dome, designed by Michelangelo, was finished 1590; the completed church was consecrated 1626.



St. Peter's Church, with Colonnade built by Bernini 1667.

Petersburg. City of Dinwiddie co., Va., on the Appomattox River. It is an important railroad center, and has considerable manufactures of tobacco and cotton goods. It was invested by Union forces June 15, 1864, and evacuated by Confederates April 3, 1865, after many assaults. A mine was exploded July 30, 1864. Pop., 1890, 22,680.

Petersen, JOHANN WILHELM, 1649–1727. Supt. at Lübeck 1677 and Lüneberg 1688; deposed 1692 for indorsing the revelations of an alleged prophetess; voluminous theological writer.

Petersen, NIELS MATTHIAS, 1791–1862. Prof. Copenhagen 1845; philological and antiquarian writer. *Hist. Danish Literature*, 5 vols., 1853–64.

Peter's Pence. Contributions to the papal treasury, exacted in England ab.725–1534; of late, free-will offerings from various countries.

Peter the Hermit, ab.1050–1115. Preacher and leader of 1st crusade 1095.

Peter the Venerable, 1094–1156. Abbot of Cluny 1122. He wrote against Jews, Saracens, and heretics.

Peterwardein. Town of Hungary, on the Danube, 44 m. n.w. of Belgrade; scene of a defeat of 180,000 Turks, Aug. 10, 1716, by Prince Eugene.

Petigru, JAMES LEWIS, 1789–1863. Atty.-gen. of S. C. 1822–30; leader of Charleston bar; Unionist, opposing nullification 1830 and secession 1860; codifier of S. C. laws.

Petiolar. Resembling or pertaining to the petiole.

Petiole. Leaf-stalk.

Petiolule. Petiole of a leaflet in compound leaves.

Petion, ALEXANDRE, 1770–1818. Pres. Hayti from 1807; at war with Christophe; a wise and efficient ruler. His small coinage is abundant.

Petion de Villeneuve, JEROME, 1753–1793. French Deputy 1789; Mayor of Paris 1791; first pres. Convention; Girondist, proscribed for opposing Robespierre.

Petis de la Croix, FRANÇOIS, 1653–1713. French Arabic scholar and court interpreter, who translated many works from the Turkish, Persian, and other languages.

Petit de Julleville, LOUIS, b. 1841. Prof. Dijon and Paris; historian of the drama. *Les Mysterès*, 1880; *Théâtre en France*, 1889.

Petite Culture. Custom of cultivating small portions of land with a relatively large application of labor and capital, especially under a peasant proprietary.

Petition of Right. Concerning divers rights and liberties, being ch. I. of 3 Car. 1; statute of great constitutional importance in Britain. Also, common law proceeding for the recovery of one's private property from the Crown's possession.

Petitio Principii. Argument which proves a point by assuming it.

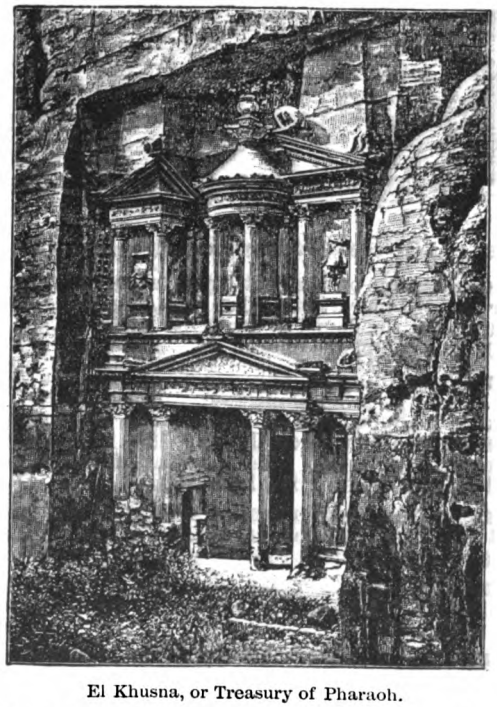
Petit Mal. Form of epileptic seizure not marked by the violent convulsion (Grand mal) so frequently associated with the disease; the form of the attack is protean.

Petit-Thouars. See DUPETIT THOUARS.

Peto, SIR SAMUEL MORTON, 1809–1889. English engineer; Baronet 1855; constructor of the Grand Trunk R.R. in Canada; M.P. 1847–54, 1859–68. His firm failed heavily 1868. *Taxation*, 1863.

Petöfi, SANDOR, 1823–1849. Hungarian poet, killed in the revolution. *Works*, 1874.

Petra. Ancient capital of Edom, afterward of the Nabatæans; in a mountain basin, the meeting-place of various caravan routes; in splendor long comparable to Palmyra or Baalbec. Its ruins are almost all built against rocky masses, or hewn into



El Khusna, or Treasury of Pharaoh.

them. Its rock tombs and cave-dwellings, with ornamental façades of late Greco-Roman style, are now beset by Bedouins, and accessible only under exceptional circumstances or with a strong military escort.

Petrarch, FRANCESCO, 1304–1374. Italian poet, celebrated for the exquisite music of his verse in *Sonnets* and *Canzoniere*. He marks the transition from mediæval allegorical poetry to the modern school, and has been called "the first true artist of Italian literature." He received the laurel crown in Rome 1341, became Archdeacon of Parma, and was canon of several cathedrals. He vainly sought to secure the removal of the Papal court from Avignon to Rome. His life was tinged by his passion for Laura, in whose praise he wrote 350 sonnets and canzoni.

Petrels (PROCELLARIIDÆ). Seventy species exist. They have tubular nostrils, long pointed wings, three webbed toes, turned forward, and a small hind toe. They fly close to the water, and rarely land. Wilson's Petrel, the most common, is black above, dusky below, the upper tail coverts white, and tail not forked. Length ab. 7 in. See STORMY PETREL.

Petri, LAURENTIUS, 1499–1573. First Lutheran Abp. of Upsala 1531.—His brother, OLAUS, 1497–1552, was an active reformer.

Petrie, GEORGE, LL.D., 1790–1866. Irish painter and antiquarian, pensioned 1849. *Round Towers*, 1830.

Petrie, WILLIAM M. FLINDERS, b. 1853. English Egyptologist and excavator. His *Inductive Metrology*, 1877, *Stonehenge*, 1880, and *Pyramids and Temples of Gizeh*, 1883, were pub. before his connection with the Egypt Exploration Fund Society. For this Society he pub. Memoirs on his work at Tanis, Nebesheh, Daphnæ, and Naukratis 1883–87. He has been subsequently engaged in independent researches. In 1886–87 appeared *Season in Egypt* and *Racial Types from the Egyptian Monuments;* later, *Historical Scarabs; Hawara and Arsinoe; Kahun, Gurob, and Hawara; Illahun, Kahun, and Gurob; Tell el Hesy* (Syria); *Medum; Tell el Amarna; Koptos.* Each of these represents a season's work. *Hist. Egypt*, 1896. At Koptos P. discovered the first remains of prehistoric Egypt. His great reputation dates from the excavations at Naukratis, which first revealed the whole influence of Egypt on Greek art. In 1892 he became Prof. of Egyptology at University College, London.

Petrifaction. Fossil that retains the perfect form and structure of the organism, but with the original substance replaced by other mineral matter; also, process by which such a change is produced.

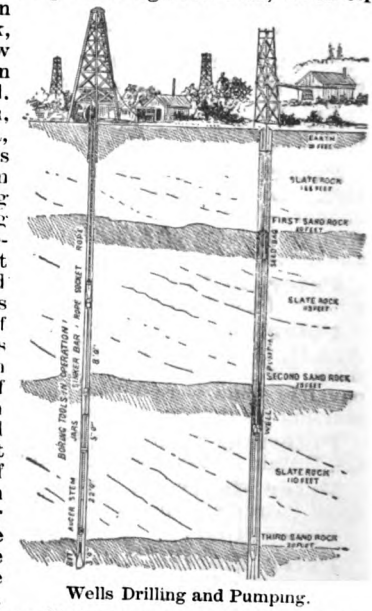
Petrified Wood. Wood whose organic matter has been replaced by mineral substances, usually opal or quartz, but whose vegetable structure and origin is more or less distinctly recognizable.

Petrography. Science that describes the rock masses of which the crust of the earth consists, with the view of eliciting the course and the causes of their development. It has respect more to their occurrence in large masses and to their mutual geological relations than to details of texture and mineral composition.

Petrolatum. See VASELINE.

Petroleum. Oil was obtained from the distillation of coal and shale in Great Britain as early as 1694, and Selligue in France made 15,000 bbls. of shale oil in 1838–43. In Glasgow from 1850 boghead coal was used. In U. S., Gesner distilled bituminous coal from Prince Edward's I. 1846, and subsequently bituminous coal from Ky. and asphaltum from W. Va. and Nova Scotia were used. In 1860 the product in U. S. reached 200,000 bbls., chiefly from the boghead coal of Scotland. The oil was called kerosene, and was used for illumination. The development of the petroleum wells of Pa. put an end to this industry in 1860.

Petroleum has been obtained in the East from the time of the building of Babylon, and has been found in various parts of the world. The great development began in 1858, when oil was obtained by an artesian well, 71 ft. deep, on Oil Creek, Venango co., Pa. It is now derived chiefly from U. S., in Pa., W. Va., N.Y., Ohio, Ind. and Cal.; in Canada, in Baku, Russia, on the Caspian Sea, and in Austria. The oil is found at various depths, from 400 to 4,500 ft., by drilling wells through the overlying strata, and when reached frequently rushes up with great force, soon diminishing, and finally the flow becomes small. The pebble sand of the Allegany district yields 1,000 bbls. per acre for each foot of depth. The cost of an equipped well is from $5,000 to $15,000. The yield is maintained by constant drilling and the discovery of new productive fields, which will doubtless continue for some years. Ultimately the supply must fail, and the world must fall back on the distillation of Black Shale.



Wells Drilling and Pumping.

The oil is transported from the wells to the refineries in wrought-iron pipes, 6 in. diameter, with pumping stations ab. 40 m. apart, and storage tanks holding 35,000 bbls. each at convenient distances. These lines extend to Chicago and Baltimore and intermediate markets.

Petroleum is the product of slow and ill-understood changes in the organic matter impregnating the beds of black shale and limestone of various geological ages, from the Paleozoic to the Tertiary, the older rocks being the chief repositories in the U. S., and the younger in the Baku fields. It is an oily liquid, yellow, greenish, brown and black in color, sp. gr. from 50° B.

in Pa. to 23° B. in Java. It is a mixture of hydrocarbons, paraffins of the formula C_nH_{2n+2} and olefines C_nH_{2n}, the former predominating in the American product and the latter in that from Russia. In U. S. the crude oil is distilled by direct heat, in cylindrical stills, holding 600 barrels, the distillate being condensed in tubes, placed in tanks of water, yielding naphtha and illuminating oils; there remains in the stills coke and tar, the former being used as fuel and the latter being distilled in smaller stills, with introduction of steam, for production of paraffin oil. The coke remaining in the still is used for electric light carbons. The crude paraffin oil is treated successively with sulphuric acid, water and caustic soda, which removes tarry matter, then cooled by a refrigerating apparatus, and the paraffin, which is thus crystallized, is filtered out and refined. The oil is used for lubrication and the paraffin for candles. The illuminating oils are refined by sulphuric acid and caustic soda. The naphthas are distilled with steam yielding gasoline and naphthas of different gravities. The sulphurous Ohio oil is distilled over copper oxide and other metallic oxides which removes the sulphur. The yield varies, Appalachian oils giving naphtha 10–11 per cent, illuminating oil 75–78, paraffin oil 2–6, residuum 3–4, and water and loss 5–8. Russian oil yields about 35 per cent illuminating oil.

The following products have been obtained from petroleum, with bpt. and sp. gr. and use, as given: Cymogen, 32° F., 110° B., ice-machines; Rhigolene, 67° F., 100° B., local refrigerant; Petroleum-ether, 104° F.–158° F., 80° B.–85° B., solvent for caoutchouc and fatty oils, and for carbureting air in gas-machines; Gasoline, 158° F.–194° F., 75° B.–85° B., extracting seed-oils, gas-machines, lamps, and stoves; Naphtha, 176° F.–248° F., 62° B.–76° B., solvent for resins in varnish making, in making oilcloth, and in stoves; Ligroin, 176° F.–248° F., 62° B.–67° B., solvent in pharmacy, and in sponge-lamps; Benzene, 248° F.–302° F., 57° B.–62° B., turpentine substitute in oil-paints; Water-white burning oil, fire test 150° F., 48° B.; Export burning oil, fire test 100° F.–110° F., 45° B.; Paraffin oil, fire test 405° F., 23° B., lubricating machinery; Paraffin, mpt. 110° F.–140° F., candles, insulating, chewing-gum; vaseline, roofing pitch, axle grease, coke, electric carbons.

Production of petroleum in 1894, in metric tons, was: U. S. 6,158,119. Russia 4,873,000, Austria 131,930, Canada 116,000, Germany 17,232, Italy 2,853.

Product U. S., 1895, bbls. 42 gals., was: Pa. 18,231,442, N. Y. and W. Va. 12,176,933, O. 16,109,101, Ind. 2,306,530, Col. 845,000, Cal. 975,000, Ky. 1,000, Wy. 2,019, total 50,652,025.

The aggregate yield of petroleum in the U. S. 1859–95 was more than 700,000,000 barrels of 42 gallons each; the yield of Russia in the same period is estimated at ab. one-eighth of that amount.

Petroleuses. Female incendiaries of the Parisian Commune 1871. Many were shot for burning public buildings.

Petrology. Division of Geology which treats of the mechanical constitution and composition of rock-masses.

Petromyzon. See LAMPREYS.

Petronel. Clumsy pistol of ancient times.

Petronius Arbiter, 1st cent. Courtier of Nero, supposed author of *Cœna Trimalchionis*, portion of a satire depicting the fashionable life of the times. It is partly in prose and partly in verse.

Pettee, WILLIAM HENRY, b. 1838. Mining engineer and mineralogist. Assistant on California geological survey 1870–71; prof. Univ. of Mich. 1875. He has contributed many scientific papers to the various societies of which he is a member. *Contributions to Barometric Hypsometry*, 1874.

Pettenkofen, AUGUST VON, 1821–1889. Austrian painter, chiefly of military scenes.

Pettenkofer, MAX, b. 1818. Prof. of Chemistry at Munich 1847; author of many discoveries and additions to scientific and sanitary knowledge, especially as to cholera and hygiene.

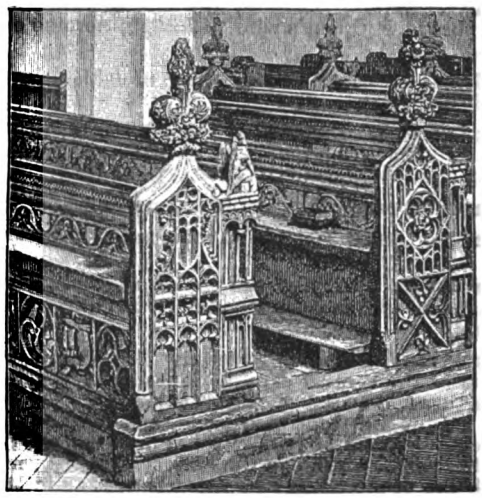
Pettie, JOHN, b. 1839. Scottish painter, R. A. 1873.

Pettis, GEORGE WILLIAM, ab. 1822–1892. American authority on whist.

Petty, SIR WILLIAM, F.R.S., 1623–1687. Prof. of Anatomy at Oxford 1651; knighted after 1660; noted chiefly as an economist. *Political Anatomy of Ireland*, 1691; *Taxes and Contributions*, 1667; *Political Arithmetic*, 1676.

Peutingerian Table. Roman road-chart, now in Imperial library at Vienna; named from Konrad Peutinger (1465–1547) of Augsburg, in whose library it was found; probably a 13th century copy of a 3d century document. It gives distances, but is a diagram rather than a map.

Pew. Inclosed seat in a church. In England the property in a pew is a mere easement; but in the U. S. a pew may be



Pews, Fressingfield Church, Suffolk, Eng.

owned by an individual and descend to his heirs as real estate. In some States property in pews is declared to be personalty.

Pewter. Alloy of lead and tin, in varying proportions. Copper, antimony, bismuth, and other metals are sometimes added. Three of tin to two of lead is the hardest and toughest alloy.

Peyer's Glands. One of the varieties of glands of the small intestines, found always in patches (agminated glands). These glands are the local seat of the disease in typhoid fever, when they are inflamed and ulcerated, and sometimes the intestine is perforated by the ulceration, a very serious complication to the disease.

Peyron, VITTORIO AMADEO, 1785–1870. Prof. Turin; author of a Coptic lexicon and grammar. He pub. sundry Greek texts, and tr. Thucydides.

Peyronnet, CHARLES IGNACE, COMTE DE, 1778–1854. French Minister of Justice 1821–28, and of the Interior 1830; violent reactionist and tool of tyranny, ennobled 1822; imprisoned 1830–36.

Peyton, BALIE, 1803–1878. M.C. from Tenn. 1833–37; U. S. Minister to Chili 1849–53; Unionist.—His cousin, EPHRAIM GEOFFREY, 1802–1876, was Chief-justice of Miss. 1870–75.

Pezet, JUAN ANTONIO, b. 1806. Pres. of Peru 1863–65.

Pezizoid. Structures resembling *Fungi* of the genus *Peziza*.

Pezuela, JACOPO DE LA, 1811–1882. Historian of Cuba 1863–68.

Pezuela, JOAQUIN DE LA, 1761–1830. Viceroy of Peru 1817–21.—His son, JUAN MANUEL, b. 1810, Gov. of Cuba 1853–54, tr. Dante, Tasso, Ariosto, and Camoens.

Pfaffian. In Higher Algebra, function derived from zero-axial skew-determinants, and closely akin to determinants in its properties. Its form is triangular: its symbols are $^1/$ ¦ and ff.

Pfaff, JOHANN FRIEDRICH, 1765–1825. Prof. Helmstadt and Halle. *Disquisitiones Analyticæ*, 1797; *Differential Equations*, 1814.

Pfaffers. Village in Switzerland, $1\frac{1}{2}$ m. s. of Ragatz. It is noted for the hot springs discovered ab. 1050, and for its Benedictine convent, founded 713.

Pfalz. See PALATINATE.

Pfeiffer, IDA (REYER), 1797–1858. Austrian traveler from 1842. The books describing her journeys were widely read.

Pfenning. German copper coin (originally silver), worth $\frac{1}{4}$ Kreuzer or $\frac{1}{100}$ Mark.

Pfleiderer, OTTO, D.D., b. 1839. Prof. Jena 1870, Berlin 1875. *Paulinism*, 1873, tr. 1877; *Philosophy of Religion*, 1878, tr. 1886–88; *Theology since Kant*, 1890.—His brother, EDMUND, b. 1842, prof. Kiel 1873 and Tübingen 1878, has pub. much in philosophy.

Pflüger, EDUARD FRIEDRICH WILHELM, b. 1829. Prof. Bonn 1859; writer on physiology.

Phæacians. People described in the Odyssey as living on an island in the farthest west.

Phædra. Wife of Theseus, to whose son Hippolytus she bore the part of Potiphar's wife to Joseph; heroine of several tragedies.

Phædrus, 1st cent. Latin writer of fables, partly from Æsop; 93 survive, in five books.

Phænogamia. Division of the vegetable kingdom, including all the flowering plants, those which produce seed containing an embryo. See SPERMATOPHYTA and ANTHOPHYTA.

Phænogamous. Relating to phænogamia.

Phænological. Periodic phenomena of plants and animals.

Phænology. Study of the connection between climate or weather and the growth of plants; term first used by Von Oettingen.

Phæodaria. Order of siliceous *Radiolaria*, with the membrane of the central capsule double, and having a chief polar aperture and accessory perforated areas. There is much pigment around the central capsule, and only one nucleus. The skeleton consists of hollow tubes or needles. These are outside the central capsule in the *Phæocystida*. A fenestrated shell with one or more large openings is present in the *Phæogromida*. There is a basket work of hollow spicules in the *Phæosphærida*, and valves like those of a mussel, but fenestrated and covered with spines in the *Phæoconchida*.

Phæophyceæ. Sub-class of *Algæ*, including all the dark-green, olive-green or brown species; also called *Melanospermæ*, *Melanosporeæ*, *Melanophyceæ*, and *Phæospermeæ*.

Phæophyll. Pigment contained in red and brown *Algæ*.

Phæosporeæ. See PHÆOPHYCEÆ.

Phaëthon. Son of Apollo, who got leave to drive the chariot of the sun, but was unable to check the horses, which came near setting the earth on fire.

Phagocytes (MESAMŒBOIDS). Sort of white blood corpuscle which feeds on bacteria that develop in the blood or the tissues of an animal.

Phalangers. Australian marsupials ranging from fox to squirrel, or even mouse, in appearance and size, but having long prehensile tails. Some are insectivorous, some herbivorous. Six incisors are present in the upper jaw, and two below. Cook's Phalanger has both index finger and thumb opposable to the other fingers. Some of the genera have a parachute similar in structure and use to that of flying squirrels.

Phalanger (*Phalanger maculatus*).

Phalangida (DADDY-LONG-LEGS). Arachnids with four pairs of long slender legs and a segmented abdomen, joined by its whole breadth to the cephalothorax. They breathe by tracheæ and have no spinning glands.

Phalanstery. Unit of social organization according to the socialistic plans of Fourier. It should be a district of country with a collection of buildings for habitations and amusement, and for all kinds of agricultural and manufacturing uses, occupied in joint possession by some 300 or 400 families. It would be self-governing, and would hold relations of alliance and exchanges with other similar groups.

Phalanx. Greek body of infantry armed with long spears and shields. The Macedonian was at first 8, afterward 12 to 16 ranks deep. The Romans used this formation before Camillus (d. 365 B.C.), and returned to it in fighting with barbarians in 2d century A.D.

Phalanx. In Botany, group of stamens, more or less united at their bases.

Phalaris. Tyrant of Agrigentum, Sicily, ab.570–564 B.C.; said to have caused the objects of his hatred to be burned alive in a brazen bull, the inventor of which was the first to suffer. The *Epistles*, pub. 1498, are not his.

Phalloideæ. Family of *Fungi*, of the order *Gasteromycetes*, comprising the so-called stink-horns and their allies. They have an extremely offensive odor.

Phallus. Sign of generation, whose worship or observance had place in the systems of the Greeks and other ancient (as of some modern) races. In Italy it survives as a charm against the evil eye.

Phanarists. See FANARISTS.

Phanerocarpæ. See SCYPHOMEDUSÆ.

Phanero-codonic Gonophore. One which possesses a fully developed umbrella, as in all gonophores that are to be set free.

Phanerogamia. Flowering plants. See ANTHOPHYTA and SPERMATOPHYTA.

Phaneroglossa (FROGS and TOADS). Sub-order of *Anura*, comprising two groups: *Proteroglossa*, with the tongue free in front, as in *Rhinophrynus*, a Mexican Toad; and *Opisthoglossa*, with the tongue fixed in front and free behind, as in ordinary Frogs and Toads. This group is sub-divided into the *Oxydactylia* and *Discodactylia*. See also ARCIFERA and FIRMISTERNIA.

Phanocles. Greek elegiac poet of uncertain date, known by fragments.

Phantom Horseman. Legends of the Phantom Horseman, which is universally regarded as a presage of death or misfortune to the person who sees it, are extremely common in various parts of England and throughout Europe. In many of the tales the horse is described as headless. The origin of the story in Europe has been attributed to the horse or horses of Odin.

Phantom Ship. Omen of ill-fortune to sailors, known in the Baltic as Carmilhan.

Pharaoh. Official title of kings of Egypt in O. T. times.

Pharaoh-Hophra. King of Egypt ab.580 B.C.; at first a conqueror, then a fugitive before Amasis; denounced by Isaiah and Ezekiel.

Pharaoh's Chickens. Egyptian vulture, common in the Mediterranean region; also called White Crow. It was sacred as a scavenger and is figured on monuments.

Pharaoh's Rat. See ICHNEUMON.

Pharetrones. See CALCISPONGIÆ.

Pharisees. Leading party of later Judaism. It originated under the Maccabees, had immense influence over the people, and was distinguished by great rigor in the observance of the Law, which by the time of Christ had pressed almost all spontaneity and sincerity out of religion. Christ approved their doctrine and reprobated their spirit. The Talmud also is severe upon them.

Pharmacology. Science of the nature and properties of substances used as medicines. See PHARMACY.

Pharmacopeia. Official list of crude drugs and the preparations made from them, used as a standard by the pharmacists of the country issuing it. It secures uniform composition of certain preparations, which is invaluable either in dispensing medicines or in consulting literature concerning medicine. In the U. S. the Pharmacopeia is revised every ten years by a convention of pharmacists.

Pharmacy. Art including everything necessary to select and prepare for administration all medicinal articles. Establishment where medicines are prepared or sold. Ancient physicians prepared their own medicines, and a drug shop has been found in Pompeii. In the Middle Ages pharmacy became more of an art. Now schools of pharmacy exist in many countries. See PHARMACOLOGY.

Pharances, d. 47 B.C. Son of Mithradates, made King of the Bosphorus by Pompey 63 B.C.; defeated by Cæsar near Zela 47 B.C., after which Cæsar sent the famous dispatch, *Veni, vidi, vici.*

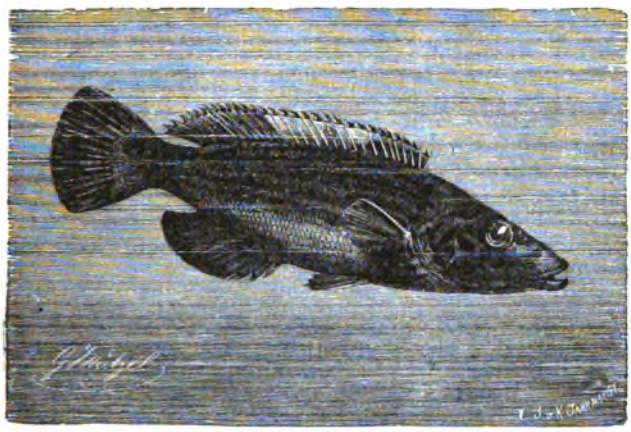
Pharos. Small island opposite Alexandria. Ptolemy II. erected here 270 B.C. a tower of white marble at a cost of 800 silver talents ($800,000) to serve as a lighthouse. This was esteemed one of the wonders of the world.

Pharsalia. District of Thessaly in which Cæsar defeated Pompey 48 B.C.

Pharyngeal Sac. Branchial sac of Tunicates.

Pharyngobranchii. See LEPTOCARDII.

Pharyngognathi. This sub-group has the lower pharyngeal bones behind the gill arches consolidated into plates. *Tilapia simonis* of the Jordan system in Palestine has been supposed to be the species of fish out of whose mouth St. Peter obtained tribute money. It is remarkable in that the male, after fertilizing the eggs of the female, gathers them up in his



Pharyngognathi (*Labrus mixtus*).

mouth, and holds them there during development; even after the young attain a considerable size, they remain in this protected locality, distending the cheeks of the father in a most remarkable way. *T. tiberialis*, of the Sea of Galilee, goes in great schools, affording remarkable draughts of fishes when caught in a seine. To this group also belong the LABRIDÆ or WRASSES (q.v.). See also ACANTHOPTERI.

Pharyngopneusta. Group formed by Huxley to include the Tunicates and Balanoglossus.

Pharynx. Organ connecting the nose and mouth with the gullet and windpipe.

Phascaceæ. Order of minute mosses, growing on damp earth, characterized by a persistent protonema.

Phascolarctus. See CARPOPHAGA.

Phascolomys. See RHIZOPHAGA.

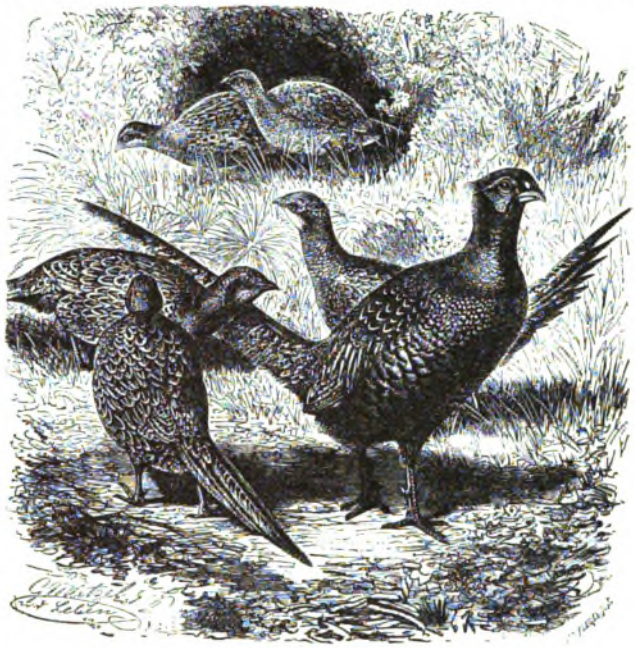
Phase. See SIMPLE HARMONIC MOTION.

Phases of the Moon. Appearances commonly distinguished as crescent, gibbous and full moon, caused by the amount of the illuminated disk turned toward the earth. Venus and Mercury present similar phases when viewed through a telescope, and to some extent Mars.

Phasianidæ (FOWLS). Family of *Gallinacei*, whose heads are partly bare of feathers and often adorned, especially in the male, with tufts of feathers, or colored fleshy lobes (combs and wattles). The beak is strong, with down-turned point. The male is markedly distinct from the female, being more powerful and more highly ornamented. Here belong Guinea-fowls, Domestic Fowls, Pheasants, Turkeys, Pea-fowls, and many other species of gorgeous ground birds of Asia, Malaysia, etc.; in all nearly a hundred species are known, originally natives of s e. Asia.

Phasmidæ. Gressorial *Orthoptera*, with long slender bodies and long legs. The wingless forms are the Walking-sticks, so called from their resemblance to dried twigs; the winged forms resemble dried leaves. They live in warm climates.

Pheasants. Sub-family of *Phasianidæ*. Gallinaceous birds of ab. 40 species, inhabiting s.e. Asia. They are brilliantly colored and have long tails and crests. The males generally are pugnacious; the male of the Blood Pheasant,



English Pheasants.

dwelling on the heights of the Himalayas, has 4 or 5 spurs on each foot. Some drum like Partridges. Both sexes of the Golden Pheasant crow. Some species of this genus attain a wt. of 3 lbs. *Phasianus colchicus*, the English Pheasant, is introduced and domesticated in Europe.

Phelloderm. Chlorophyll-bearing cells produced on the inner side of the cork meristem of certain trees.

Phellogen. Growing layer of cork cells in bark of exogenous plants.

Phelps, ALMIRA (HART) LINCOLN. 1793–1884. Sister of EMMA WILLARD (q.v.), teacher at Troy, N. Y., and at Baltimore, 1841–55; author of text books, chiefly scientific.—Her son, CHARLES EDWARD, b. 1833, was Brig.-gen. U.S. Vols. 1864, M. C. 1865–69, and judge Baltimore Superior Court, 1882.

Phelps, AUSTIN, D.D., 1820–1890. Prof. Andover 1848–79. *Still Hour*, 1859; *Theory of Preaching*, 1881.—His wife, ELIZABETH STUART, 1815–1852, wrote *Sunny Side*, 1851, and other pious or juvenile tales.—Their daughter, ELIZABETH STUART, b. 1844, has pub. *The Gates Ajar*, 1868; *Hedged in*, 1870; *Avis*, 1877; *Dr. Zay*, 1884; *A Singular Life*, 1895; *Chapters from a Life*, 1896, and other books of marked power and high moral purpose. She became Mrs. Herbert D. Ward, 1888.

Phelps, EDWARD JOHN, LL.D., b. 1822. Law prof. at Yale 1881; U. S. Minister to England 1885–89.—His father, SAMUEL SHETHAR, 1793–1855, was U.S. Senator from Vt. 1838–51 and 1853–55.

Phelps, SAMUEL, 1804–1878. English actor and manager.

Phelps, WILLIAM WALTER, LL.D., 1839–1894. M. C. from N. J. 1873–75 and 1883–89; U. S. Minister to Austria 1881–82, and to Germany 1889–93.

Phenacetin. $C_2H_5.O.C_6H_4.NH.C_2H_3O$. Acetparamidophenetol; white crystalline solid, melting at 132.5° C.; prepared by the action of acetyl chloride upon paramidophenetol; powerful febrifuge.

Phenacite. Be_2SiO_4. Beryllium silicate; mineral resembling quartz in some respects. It has been found in Siberia, Col., and N. H., associated with several varieties of gem-minerals, and is itself sometimes used as a gem.

Phenacodus. Extinct mammal from the Wahsatch Eocene of Wyoming, resembling the tapir in its nasal bones, and having a very long tail, hind feet semiplantigrade, and pig-like molar teeth; supposed by Cope to be the ancestor of all hoofed mammalia, monkeys, and man.

Phenakistoscope. Toy devised by Plateau, similar to the STROBOSCOPIC DISK (q.v.)

Phenanthraquinone. $C_{14}H_8O_2$. Orange needles, melting at 198° C.; prepared by the action of chromic acid upon phenanthrene.

Phenanthrene. $C_{14}H_{10}$. Solid hydrocarbon, crystallizing in plates and melting at 100° C.; found in coal tar. It is present in anthracene oils, and may be separated by the oxidation of the anthracene, leaving the phenanthrene. It is used in making printers' blacks.

Phenetol. $C_6H_5OC_2H_5$. Phenylethyl ether; bpt. 172° C.; liquid of very agreeable odor, prepared from diazobenzene nitrate and ethyl alcohol.

Phenetol Red. Sodium salt of the product of the action of diazophenetol upon a naphtholdisulphonic acid.

Phenol. C_6H_5OH. Carbolic acid; colorless crystalline mass of strong odor, melting at 41° C. It is prepared from coal tar. The oils, distilling from 150°–225° C., are treated with caustic soda solution, the clear solution then acidified by sulphuric acid, in which the phenol is insoluble, and which causes its separation as an oil. It is then rectified. It is slightly soluble in water. It is used largely as an antiseptic and for the preparation of other products, as salicylic acid and picric acid. It is poisonous and should be used with care about extensive wounds. It is very easily acted upon by chemical agents. It forms unstable salts, as the sodium salt C_6H_5ONa (called a phenylate or phenate), which is decomposed by water. The name phenol is applied to the class of compounds obtained by replacing the benzene hydrogen of aromatic hydrocarbons with hydroxyl.

Phenol Alcohols. Substances which are at once alcohols and phenols, as $HO.C_6H_4.CH_2OH$, hydroxybenzyl alcohol. See ALCOHOLS and PHENOLS.

Phenol Brown. See PHENYL BROWN.

Phenol Colors. Artificial coal-tar colors, prepared from phenols, or having the constitution of a phenol; *e.g.* eosin.

Phenolphthalein. $C_{20}H_{14}O_4$. Phthalein of phenol, produced by heating phenol with phthalic anhydride and sulphuric acid; yellow mass, insoluble in water. Used as an indicator, it gives a deep red with alkalies, and is colorless with acids, in dilute solution. It is the first member of the class of phthaleins.

Phenols. Compounds in which hydroxyl (OH) is attached to a carbon atom which is a member of a closed ring. So phenol is BENZENE (q.v.), in which hydrogen has been replaced by hydroxyl. The compounds present certain similarities to the alcohols, but have a more acid character. See PHENOL. By oxidation they are usually broken up and do not furnish acids or ketones. Examples: Phenol, cresol, naphthol.

Phenol Sulphonic Acid. $HO.C_6H_4.HSO_3$. Known in three forms: ortho, meta, and para. They are all white crystalline bodies. The ortho and para phenol sulphonic acids are formed by the action of sulphuric acid upon phenol. The ortho acid is used as an antiseptic.

Phenomenology. Science of phenomena or of the laws of events, including their classification and the order of their dependence and conditions; contrasted with Ontology.

Phenomenon. 1. Any event which occurs in time and conditioned by some cause, whether the event be related to consciousness or not. 2. Appearance essentially related to mind and expressed in terms of consciousness, or a relation to knowledge.—In science, any event, whatever its character or circumstances.

Phenyl. C_6H_5. Group or radical derived from benzene by the removal of one atom of hydrogen from it. $C_6H_6—H = C_6H_5—$. Constituent of numerous aromatic compounds. It does not exist in the free condition.

Phenyl Acetate. $CH_3.COO.C_6H_5$. Bpt. 193° C. Liquid of agreeable odor, prepared by the action of acetamide upon phenol.

Phenyl Alcohol. See PHENOL.

Phenyl Amine. See ANILINE.

Phenylamine Blue. See DIPHENYLAMINE BLUE.

Phenyl Brown. Yellow powder, somewhat explosive; produced by the action of nitric acid upon crude phenol.

Phenyl Cyanide. See BENZONITRILE.

Phenylene. C_6H_4:. Group or radical derived from benzene by the removal of two atoms of hydrogen. $C_6H_6—2H = C_6H_4$:. Three forms of the group, ortho-, meta-, and paraphenylene, are recognized. Derivatives are called phenylene compounds.

Phenylene Blue. Blue dyestuff prepared by the action of aniline and oxygen upon paraphenylenediamine.

Phenylene Brown. See BISMARCK BROWN.

Phenylenediamine. C_6H_4: $(NH_2)_2$. Diamidobenzene; known in three forms, corresponding to the three phenylene groups; easily oxidizable white solids, prepared by the action of hydrogen upon the corresponding nitranilines and dinitro compounds; bases, forming permanent salts with hydrochloric acid. The meta compound is used as a test for nitrous acid, the minutest amount of the acid giving a yellow coloration with the compound.

Phenyl Ether. $(C_6H_5)_2$:O. Long needles, prepared from phenol by treating it with zinc or aluminium chloride.

Phenylhydrazine. $C_6H_5.NH.NH_2$. Colorless crystals, easily uniting with hydrochloric acid to form a chloride. This salt is best prepared by the action of hydrogen on diazobenzene chloride. It is a common reagent for the detection of aldehydes, ketones and glucoses, with which characteristic compounds are formed.

Phenyl Salicylate. See SALOL.

Phenyl Sulphone. $(C_6H_5)_2$:SO_2. White crystalline body, prepared by the action of sulphuric anhydride upon benzene. See SULPHENES.

Phenyl Sulphurous Acid. See BENZENE SULPHONIC ACID.

Phenyl Violet. $C_{28}H_{25}N_3O_4$. Acetate of orthotolylpara rosaniline; made from the residues of the fuchsine manufactured by the arsenic acid method; green powder, dyeing wool red-violet.

Pheræ. City of Thessaly, near Mt. Pelion; capital of Jason and Alexander, 378–357 B.C.

Pherecrates, 5th cent. B.C. Athenian dramatist. Fragments survive.

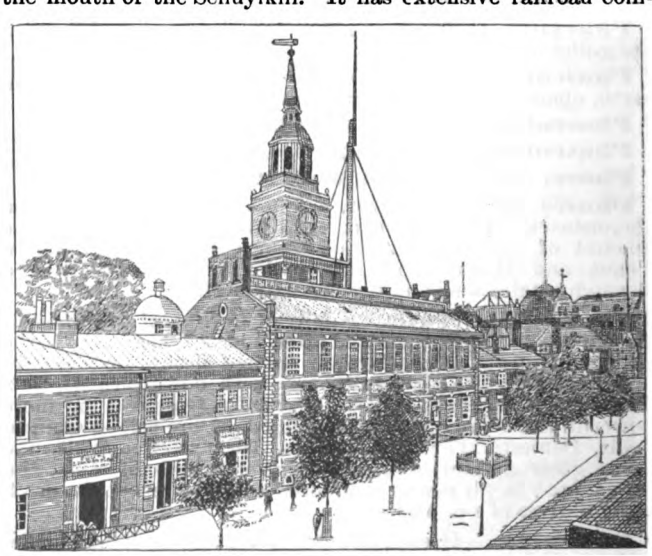
Pherecydes. 1. Greek philosopher of Syros, 6th cent. B.C. 2. Athenian writer on mythology and history, 5th cent. B.C. Both are known by fragments.

Phi Beta Kappa. College fraternity founded 1776 at William and Mary Coll., Va.

Phidias, ab. 500–ab. 432 B.C. Greatest sculptor of ancient Greece. Art director of Athens during the ascendency of Pericles. The Parthenon and Propylæa were thus among his works. He is best known through the sculptured decorations of the Parthenon, now mainly in London. Although it is not certain that he personally worked on any of these figures, it is possible, and they represent his original models. As a sculptor he was most actively employed on the colossal gold and ivory temple statues, like the Zeus at Olympia and Athena in the Parthenon. Among other colossal bronze figures he executed the Athena Promachus for the Acropolis. The later Greek types of Athena and Zeus were his creation. The bust known as the Otricoli Jupiter in the Vatican is the best Roman copy of the later type. The characteristics of this sculptor were simplicity, sublimity and grandeur.

Phigalia. Ancient town of s. w. Arcadia, noted for a temple of Apollo, described 1765. Its fine frieze, showing fights between Centaurs and Lapithæ, and Greeks and Amazons, was taken to the British Museum 1812.

Philadelphia. Largest city of Pa., on the Delaware, at the mouth of the Schuylkill. It has extensive railroad com-



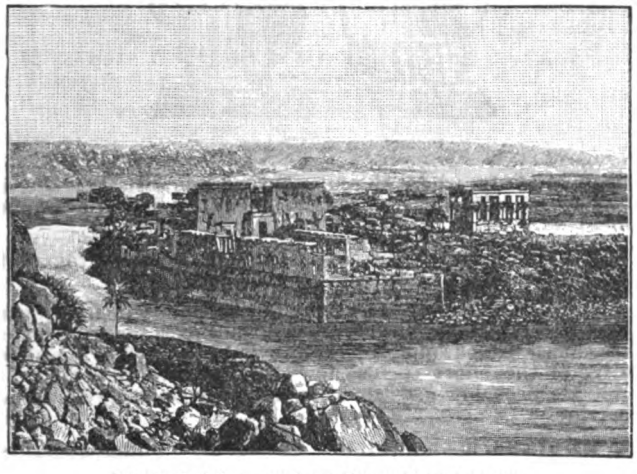
Independence Hall.

munications and a large commerce. Most of it, except the newly annexed suburbs, is regularly laid out. It covers 129

sq. m., the city and county being coextensive. It has ab. 1,300 m. of streets, of which ab. 350 are paved. Water is supplied by pumping, mainly from the Schuylkill, with a small proportion from the Delaware. The principal park is Fairmount, on both banks of the Schuylkill, in the outskirts of the settled area. It comprises 2,740 acres, or ab. 4 sq. m. There are numerous other parks and open squares. The city is thoroughly sewered, drainage being had into the Delaware and Schuylkill rivers. It has extensive manufactures, consisting largely of iron and steel, cotton and woolen goods, carpets, drugs, chemicals, sugar, and molasses. It is the site of Univ. Pa., Jefferson Medical Coll., Girard Coll., and other educational institutions. Swedish colonists located here 1636. The city was founded by Penn 1682, and from the commencement had a steady growth. It was the place of meeting of the Continental Congress from 1774 till 1783, excepting the year of its occupation by the English troops, in Carpenters' Hall 1774, subsequently in the State House, Independence Hall. Here the Declaration of Independence was adopted and the U. S. Constitution was framed. It was the capital of Pa. till 1799, and of the U. S. 1790–1800. Pop., 1890, 1,046,964.

Philadelphians. Mystical sect, founded 1652 in London by Dr. John Pordage (1608–1698), and other disciples of Jakob Boehme (1652–1710), theosophist and mystic. Mrs. Leade was its prophetess. It died ab. 1710.

Philæ. Island in the Nile, near Assouan, and just above the First Cataract; site of some picturesque ruins of the Ptolemaic period. It was celebrated in Egyptian Mythology as the burial-place of Isis and Osiris, and thus became a resort for pious pilgrims.



Island of Philæ, seen from the southwest corner.

Philaret, 1782–1867. Abp. of Tver 1819; Metropolitan of Moscow 1821; eminent for piety, learning, eloquence, administrative ability, and knowledge of Western thought.

Philaster. Bp. of Brescia in 4th century; writer on heresies.

Philately. Study and gathering of postage-stamps; begun ab. 1850, and since carried to great lengths by many persons in all civilized lands. It is now far more popular (at least in the U. S.), though far less instructive, than numismatics; for stamps suggest only geography, while coins cover almost the whole ground of known history. Numerous journals are devoted to philately, as well as organized societies of stamp collectors. The sale of stamps is a well recognized industry. The word was coined by a French collector (Herpin) 1865.

Philbrick, JOHN DUDLEY, LL.D., D.C.L., 1818–1886. Supt. of Boston schools 1857–74 and 1876–78. *City School Systems,* 1885.

Philelpho, or **Filelfo,** FRANCESCO, 1398–1481. Italian teacher; Sec. to Venetian Embassy at Constantinople 1426–27. After acquiring a knowledge of the Greek language and literature, then almost wholly unknown in the West, he returned to Italy and played an important part in the Revival of Learning then in progress, lecturing at Bologna, Florence, Milan, and Rome.

Philemon, ab. 365–262 B.C. Attic writer of the New Comedy, imitated by Plautus. Fragments survive.

Philemon AND **Baucis.** Phrygian entertainers of Zeus and Hermes; celebrated in Ovid's *Metamorphoses.*

Philemon, EPISTLE TO. Eighteenth N. T. book, written by St. Paul to a Colossian, interceding for a fugitive slave, Onesimus.

Philharmonic Society. 1. Of New York; organization of professional musicians whose purpose it is to give concerts of high-class music on the communal plan; organized April 5, 1842; incorporated Feb. 17, 1853. It has given annual concerts since 1842. Carl Bergmann was conductor 1865–76. His successors have been Dr. L. Damrosch, T. Thomas, A. Neuendorff and Anton Seidl. 2. Of London; founded 1813 for the encouragement of orchestral and instrumental music. Some of the greatest masterpieces were written for it, among them the Choral Symphony of Beethoven. 3. Of Vienna; an orchestral body with organization and purpose similar to those of the New York Society; organized 1842 by Otto Nicolai.

Philetas, OF COS, 3d cent. B.C. Poet and critic at Alexandria; tutor of Ptolemy Philadelphus.

Philidor, FRANÇOIS ANDRÉ (DANIGAN), 1726–1795. French chess player, composer of 22 operas, besides intermezzi and church music. *Jeu des Echecs,* 1777.

Philip. One of the Apostles; in later life active, it is said, in Asia Minor.

Philip. Evangelist: one of the 7 deacons. Acts vi., viii.

Philip II., OF MACEDON, 382–336 B.C. King 359; conqueror of Thessaly, and at Chæronea 338 of all Greece; father of Alexander, who carried out his plan of invading Persia.

Philip V., 237–179 B.C. King of Macedon 220; at war with Rome 210–205 and 200–197; defeated at Cynoscephalæ 197.

Philip I., OF FRANCE, 1052–1108. King 1060; twice excommunicated.

Philip II. (AUGUSTUS), 1165–1223. Son of Louis VII.; King 1180. He took part in the 3d crusade 1190, warred with England and other neighbors, greatly enlarged his domains, quarreled with the Pope, gained a memorable victory at Bouvines 1214, and did much for Paris and its university.

Philip III., 1245–1285. Son of Louis IX.; King 1270; a wise and pacific ruler.—His son, PHILIP IV. ("LE BEL"), 1268–1314, King 1285, taxed the clergy, defied the Pope, and later won infamy by persecuting and destroying the Templars 1310–14.—His 2d son, PHILIP V., reigned 1316–22.

Philip VI., 1293–1350. King 1328; founder of the House of Valois; at war with England from 1337; worthless as man and ruler. He was defeated at Cressy and lost Calais 1346–47.

Philip II., OF SPAIN, 1527–1598. Son of Charles V.; King 1555; most powerful monarch in Europe, holding Spain, vast dominions in America, Africa, and E. Indies, the two Sicilies, Milan, Burgundy, the Low Countries, and, from 1581, Portugal. He exhausted his dominions in attempts to subjugate the Netherlands, and in wars with England and France. The elaborate preparations of the Armada 1588 ended in humiliating failure. His long reign was an industrious and dogged effort to maintain the sternest absolutism and the most rigid Catholic orthodoxy, and to enforce them by any means: sincerity and justice had no more value with him than human life. In modern eyes he is the most offensive, as he was the most destructive, of monarchs.—His son, PHILIP III., reigned 1598–1621, and expelled the Moors: his son, PHILIP IV., 1621–1665, lost Portugal.

Philip II., King of Spain.

Philip V., 1683–1746. Grandson of Louis XIV.; King 1700; first of the Spanish Bourbons; feeble and incapable. The War of Succession, 1700–13, stripped Spain of the Netherlands, Italy, and Gibraltar.

Philip. German emperor 1198–1208; son of Frederic I.

Philip, or METACOMET, d. 1676. Indian chief who carried on a devastating war against the Mass. colonists 1675.

Philip THE BOLD, 1342–1404. Son of John of France; Duke of Burgundy 1363.—His grandson, PHILIP THE GOOD, 1396–1467, was in alliance with England 1419–35, and inherited most of the Netherlands ab.1430, making his realm the strongest in Europe.

Philiphaugh. In s. Scotland, near Selkirk; scene of defeat of Montrose Sept. 13, 1645.

Philippi. City of Macedonia, famous for the victory won by Octavianus and Antony over Brutus and Cassius 42 B.C.; seat of a church addressed by St. Paul ab.62 from his Roman prison, in an epistle which is the 11th N. T. book.

Philippics. Three great orations of Demosthenes against Philip of Macedon. The Olynthiac orations are sometimes so styled, as also Cicero's orations against Antony.

Philippine Islands. Large group in w. Pacific, n.e. of Borneo, the principal being Luzon and Mindanao; discovered 1521. They belong to Spain and are very fertile. Area ab. 115,000 sq. m. The natives rose in rebellion 1896. Pop. ab. 7,500,000.

Philippine Islanders. The original inhabitants, NEGRITOS (q.v.) or Ætas, now number ab. 25,000 in population. The chief inhabitants are Malays, of whom the TAGALS (q.v.) and Visayas are the most important tribes and number ab. 3,300,000.

Philippopolis. Ancient city of E. Rumelia, on the Maritza; taken by Turks 1363, and by Russians 1878. Pop. ab. 33,500.

Philippoteaux, HENRI EMMANUEL FÉLIX, 1815–1884. French painter of battle-scenes and panoramas.—His son, PAUL, b. 1846, exhibited *The Battle of Gettysburg*, a cyclorama, in the U. S. 1883.

Philippus, MARCUS JULIUS, 204–249. Arabian; Emperor 244, by murder of Gordian; defeated and slain by Decius, after celebrating the millennium of Rome 248.

Philips, AMBROSE, 1671–1749. English poet and dramatist; ed. *Freethinker* 1718.

Philips, EDWARD, 1630–ab.1695. English author, nephew of Milton.—His brother, JOHN, 1631–ab.1707, pub. satires and translations.

Philips, JOHN, 1676–1708. English poet. *Splendid Shilling*, 1701; *Cider*, 1708; *Blenheim*, 1705.

Philips, KATHERINE ("ORINDA"), 1631–1664. English poet.

Philistines. Warlike tribe, occupying the s. coast of Palestine; gradually subdued by the Israelites, and broken up by Assyrians and Egyptians: commonly regarded as of Aryan descent. The name was applied by M. Arnold to dull or prejudiced Conservatives, opponents of light and progress.

Philistus, ab.435–ab.361 B.C. Greek historian of Sicily.

Phillimon, JOHN GEORGE, LL.D., 1809–1865. London lawyer, M.P. 1852. *Private Law among the Romans*, 1863.—His brother, SIR ROBERT JOSEPH, D.C.L., 1810–1885, was Judge of the Arches Court 1867–75, and of Admiralty 1867–83. *International Law*, 4 vols., 1854–61.

Phillip, JOHN, 1817–1867. Scottish painter, chiefly of Spanish scenes; R.A. 1859.

Phillipps, ADELAIDE, 1833–1882. American singer.

Phillips, GEORG, 1804–1872. German writer on history and canon law. *Das Kirchenrecht*, 7 vols., 1845–72.

Phillips, JOHN, 1719–1795. Founder of Phillips Exeter Academy, N. H., 1781.

Phillips, JOHN, 1800–1874. Prof. of Geology in London, Dublin, and Oxford. *Geology*, 1837–38; *Palæozoic Fossils*, 1841.

Phillips, JOHN ARTHUR, 1822–1887. English geologist and metallurgist. *Mining and Metallurgy of Gold and Silver*, 1867; *Ore Deposits*, 1884.

Phillips, PHILIP, b. 1834. American singing evangelist.

Phillips, WENDELL, 1811–1884. American reformer, unsurpassed in oratory and in energy, especially against slavery; labor and prohibition candidate for Gov. of Mass. 1870. His lecture on *The Lost Arts* is a classic. *Speeches*, 1863–84.

Phillips, WILLIAM, 1731–1781. M.P. 1774; Major-gen. 1776; distinguished in the American war.

Phillips, WILLIAM, 1775–1828. English geologist and mineralogist. *Outlines of Mineralogy and Geology*, 1815; *Introduction to Mineralogy*, 1816.

Philochorus, 3d cent. B. C. Historian of Attica. Fragments of his work remain.

Philoctetes. Inheritor of Hercules' arrows; these presents were a reward for his having erected and set fire to the

Philoctetes and Ulysses.

pile on Mt. Oeta, where Hercules burned himself. Partaker in the siege of Troy; slayer of Paris; subject of a drama by Sophocles.

Philodemus, 1st cent. B.C. Greek epicurean. Fragments of his writings exist.

Philo-Judæns, d. after 40. Jewish philosopher, Alexandrian Neo-Platonist, who developed the Zogos doctrine which introduced Greek philosophy into Palestine; chief representative of the effort to fuse Jewish faith with Hellenic culture. He probably had no little influence on early Christian doctrine.

Philolaus, b. ab. 480 B.C. Pythagorean philosopher, first to propound the earth's motion.

Philology. This has the twofold task of classifying the languages of the world, co-ordinating and studying them, and of stating and solving all problems of speech in itself. It touches history and philosophy on one side, and physiology on the other. It is not quite the same thing as the science of language. The latter defines itself; the former, with language as its basis, takes up questions of law, culture, art and religion, whatever is expressed by the word humanities. Its narrowest field is the study of words, and this study goes hand in hand with phonetics. A word is a sound or combination of sounds, and this, not the letters, which merely serve as symbol, is the starting point of the philologist. Words, singly and in combination, make language; the dividing line between the signs, calls, and other means of communication used by brutes, and human speech, is admitted to be the conventional, communal and progressive character of the latter. The former are emotional signs, stable, and directly joined with physical causes. Human beings use speech as an art, and constantly improve it. Human speech, moreover, is articulate, and therefore subject to analysis into the sounds which compose it; whence our alphabet, an inadequate symbolic register of the chief sounds in a given language. Language being progressive, the earliest forms of speech must have been as rude and general as possible, expressing the most obvious physical facts in the most obvious way. The earliest form of the word is the root, which holds the crude or general meaning which is afterward modified by many changes of form to signify, (1) particular changes of the general meaning, and (2) changes of application, as in the inflections. See COMPARATIVE PHILOLOGY.

Philomēla. Sister of Procne, wife of Tereus, King of Thrace. Dishonored by him, she was metamorphosed into a nightingale.

Philopena. German game; an almond with two kernels is divided between two persons, and the one who first receives anything from the other must give a present.

Philopœmen, ab. 252–183 B.C. "Last of the Greeks"; of Megalopolis in Arcadia; 8 times general of the Achæan league. After gaining great honor and rendering noble services, he was taken prisoner by Messenians and poisoned.

Philosopher's Stone. See ALCHEMY.

Philosopher's Wool. See ZINC OXIDE.

Philosophy. Reflection upon the totality of things with a view to ascertaining their unity, relation and ultimate explanation. It comprehends both antology and phenomenology, though sometimes identified with the former, and sometimes with certain functions of the latter. It differs from any special science in the comprehensiveness of its subject matter, in that it embraces that of all the sciences, and from all the sciences in the extent to which it employs reflection, deductive method, and analysis, and excludes experiment. Philosophy is thus an instrument or method for determining the organic unity and meaning of all knowledge, with special reference to the ultimate nature of being and the laws of phenomena.

Philosophy, NATURAL. See PHYSICS.

Philostratus, ab.180–ab.250. Greek sophist at Rome, whose *Lives of the Sophists* and of Apollonius of Tyana are extant, with poems and epistles. Two namesakes of his, somewhat later, and one in 1st cent., left writings.

Philoxenus, 435–380 B.C. Greek dithyrambic poet of Syracuse, Italy, Corinth and Asia. Fragments remain.

Philters. Concoctions of herbs and other materials, often used in ancient and mediæval times, and still by the superstitious, to induce love in him who drank them. One of them is said to have maddened the poet Lucretius. They are still common in the East.

Philydraceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 3 genera and ab. 3 species, natives of Australia, Malaysia, e. Asia, and the Pacific Islands.

Phinehas. 1. Son of Eleazar and grandson of Aaron, high priest of Israel. 2. Son of Eli, slain with his brother Hophni, in battle with the Philistines, when the ARK OF THE COVENANT (q.v.) was captured.

Phips, or **Phipps,** SIR WILLIAM. 1651–1695. Boston merchant, knighted 1687 for recovering Spanish treasure lost near the Bahamas; sheriff of New England 1688; Gov. of Mass. 1692–94. He took Port Royal, N. S., 1690, attacked Quebec 1691, and stopped the witchcraft trials 1692.

Phlebenterata. See EOLIDÆ.

Phlebitis. Inflammation of the veins; apt to produce blood-poisoning or to form a clot (see THROMBOSIS), which, if separated from the walls of the vein and carried along in the circulation, may plug up a blood-vessel, forming an embolism.

Phlebotomy. Extraction of blood from a vein as a remedial measure. The vein known as the median cephalic on the front of the arm at the elbow is usually selected for the operation.

Phlegethon. In Greek Mythology, river of flames in the lower world.

Phlegmasia Dolens, or PHLEGMASIA ALBA DOLENS. Painful swelling of the leg, usually of septic origin, consequent upon child-birth; popularly known as Milk-leg.

Phlegmon. Inflammation attended with the formation of pus which is not confined to the part inflamed, but spreads within the tissues.

Phlegon, 2d cent. Greek writer, of whose work on *Marvels*, his *Olympiads*, and his treatise on *Long-lived Persons*, portions are extant.

Phloem. Part of a fibro-vascular bundle composed of cribrose-cells.

Phloem-Sheath. See PERICAMBIUM.

Phlogiston. See CHEMISTRY.

Phlogopite. Variety of mica in which is relatively a larger amount of magnesium and a smaller amount of iron than in the biotite variety. Its color is usually some shade of yellow, brown, or copper red.

Phloroglucin. $C_6H_3 : (OH)_3$. Trihydroxybenzene; white solid, melting at 218° C.; formed by the fusion of certain resins, and also resorcin, with potash or soda; isomer of pyrogallic acid.

Phlox. Genus of showy-flowered plants of the natural family *Polemoniaceæ*, natives of N. America; much planted for ornament.

Phlox paniculata (var.).

Phloxine. $C_{20}H_4Cl_2Br_4O_5K_2$. Potassium salt of dichlortetrabromfluorescein; made by the action of bromine on dichlorfluorescein; yellow powder, soluble in water, and dyeing wool red; also, the corresponding tetrachlor compound.

Phocæa. Ionian city of w. Asia Minor, whose people were active and hardy mariners. Attacked by Persians ab. 500 B.C., they migrated westward; some of them founded Marseilles.

Phocas I., d. 610. Byzantine emperor 602; deposed as a tyrant, and executed.—II. Emperor 963; conqueror in several wars; murdered by Zimisces, his successor.

Phocidæ. Family of *Pinnipedia*, comprising the true Seals, numerous in species, abounding in all seas, but especially in the colder regions. They are unable to use their hind feet when on land, as these are directed backward and included with the tail in a sort of rudder or propeller. They have incisors in both jaws and moderate-sized canines.

Phocion, 402–317 B.C. Athenian statesman and general, who, after fighting the Macedonians with success, foresaw Philip's triumph and advocated submission, opposing Demosthenes. A pure patriot of high character, he was condemned to the hemlock; but his memory was honored after death.

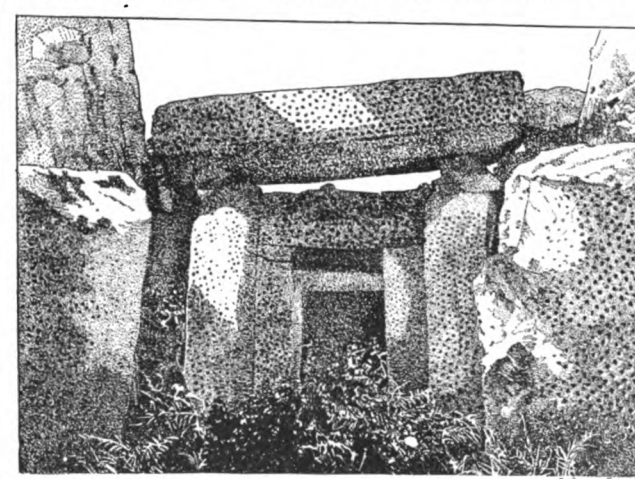
Phocis. District of Greece w. of Bœotia, containing Mt. Parnassus and the Temple of Delphi. The Sacred War, 355–346 B.C., ended in the defeat and punishment of the Phocians by Philip.

Phocylides, 6th cent. B.C. Greek elegiac poet.

Phœbus. See APOLLO.

Phœnician. See SEMITIC.

Phœnicians. Semitic race occupying a strip of coast land in Syria. Tyre, Sidon, Berytus, and Tripolis were some of their


Phœnician Ruins in Malta.

cities; among their colonies, Carthage, Hippo, Utica, Gades. They were the most eminent navigators and traders of antiquity, visiting the w. coast of Africa and even the British isles. The invention of letters, arithmetic, astronomy, navigation, manufacture of glass, and coinage have been ascribed to them. Phœnicia was conquered by Cyrus 537 B.C., by Alexander 332, by the Romans 47 B.C.

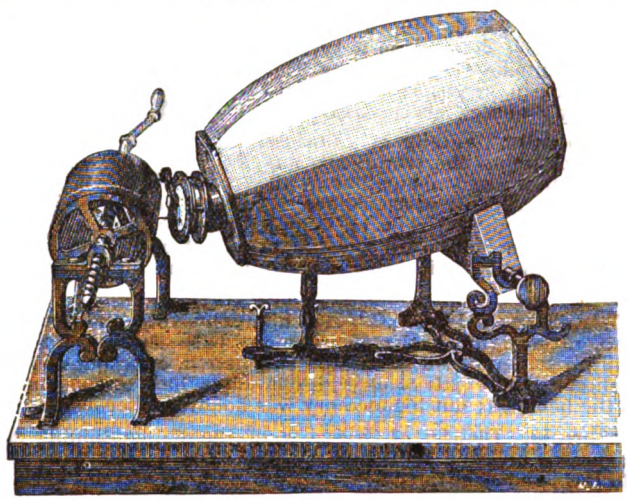
Phœnicopteridæ (FLAMINGOES). Family of African and S. American Lamellirostral birds, resembling the *Anseridæ* in the structure of the feet and bill, and the Herons in the length of the legs. The bill is suddenly curved downward at the middle.

Phœnix. Mythical bird of ancient Egypt, supposed to rise from flames.

Phœnix Column. Hollow wrought-iron column, formed by riveting together several segmental shapes with flanges; so called because made by the Phœnix Bridge Company.

Pholadidæ (BORING MUSSELS). Family of Lamellibranchs, including forms having the valves of the shell gaping and with accessory pieces on the hinge (or on the siphons, in *Teredo*). The mantle has only a small opening for the foot, but there are very long siphons. They bury deeply in sand, wood, or stone, and protrude the siphons. The Ship-worm, *Teredo*, does much damage by its perforations of the hulls of ships and the piles of docks and wharfs.

Phonautograph. Instrument contrived by Léon Scott 1858. It consists of a hollow paraboloid, closed at its narrow end by an elastic membrane having a stylus attached at its middle point. The stylus is just in contact with the surface of a smoked revolving cylinder, in such a position that a uniform



Scott's Phonautograph.

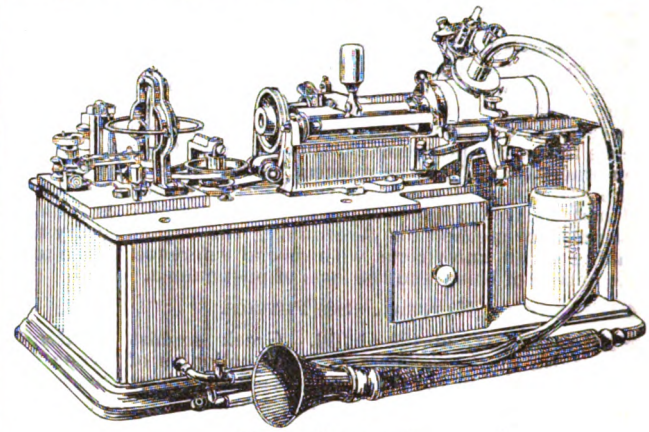
line is traced upon the cylinder if the membrane be at rest. If, however, it be thrown into vibration by waves of sound entering the paraboloid, the stylus describes an undulating line which varies in its form according to the frequency, amplitude, and complexity of the sound wave.

Phonetics. Science which investigates the sounds of the human voice, and is thus allied with both physiology and physics. It is among the latest developments in philology, and is not yet fixed in its principles and methods; notably, it has not yet produced a system of symbols which all scholars are willing to accept, though various schemes, such as the "visible speech," have been suggested. The importance of phonetics lies in the help it affords to the study of sound-changes, and hence of all development and differentiation of speech. The simplest elements of speech, usually known by the name of their symbols, as the alphabet, or letters, are divided into vowels and consonants; in reality, not only is the hard and fast dividing-line impossible (sounds such as *r* or *n* may be vowel or consonant), but there is no limit to the variety of these sounds, according to the position of the vocal organs. A consonant may be defined as the closer "less continuable" sound, which, combined with a vowel, the open "continuable" sound, makes up the syllable. The symbols *b, d, g; p, t, k*, are the "explosives" or mutes; the "forcatives," rubbing or lingering consonants, are *th* (*thy*), *th'* (*thigh*), *f, v, s, z;* the nasals *m, n;* and the liquids *r, l*. These, again, are divided into lip-sounds, *b, p, v, f, m;* tongue (or teeth) sounds, *d, t, th, th';* and palatals, or gutturals, *g, k*. Still another division is made; consonants formed with a distinct effort of the larynx are called sonant, *b, d, g, v, z*, as compared with the "surds," *p, t, k, f, s*. The English-speaking student must pronounce the vowels after the Italian fashion. With this caution a simple table, arranged according to the various positions of the vocal organs, may indicate the vowels:

$$i,\ i^{e},\ e^{l},\ e,\ e^{a},\ a^{e},\ a,\ a^{o},\ o^{a},\ o,\ o^{u},\ u^{o},\ u.$$

Here a^{e} is our sound of *a* in *hat*, while a is the sound in *father*. Diphthongs are combinations of vowels like *i* in *write*, which is really made up of two sounds, though often miscalled a vowel.

Phonograph. Invention of Edison, somewhat analogous to the phonautograph of Scott. It consists of a horizontal cylinder carrying a screw thread, which rotates with a uniform lateral motion. The cylinder is covered with tin foil: upon this a stylus fixed to the under side of a vibrating plate is made to press lightly. When the cylinder is turned and at the same time the membrane is thrown into vibration by the voice or other source of sound, the style produces depressions in the groove upon the foil of varying depth, the variations depending upon the amplitude and character of the sound-waves. If this groove be again followed by the stylus, the original mo-



Edison's Phonograph.

tions will be reproduced and transferred to the diaphragm, which in turn will send out corresponding sound-waves into the air. The recently improved instrument of Edison uses peculiarly prepared cylinders of wax in place of tin foil.

Phonography. See SHORTHAND.

Phonolite. See CLINKSTONE.

Phonomotor. Apparatus devised by Edison for changing the energy of sound into that of a rotating mass. A stretched elastic membrane has attached at its center a pawl, the end of which rests on the serrated rim of a ratchet wheel, the teeth so sloped that the pawl will slide over them easily in one direction, but will catch if moving in the opposite direction. In this way a continuous vibration of the membrane, caused by the impact of sound waves, is able to produce rotation of the wheel, the rim of the ratchet passing under the pawl away from the membrane.

Phonoplex. System of telegraphy devised by Edison, by which the capacity of an ordinary telegraph line can be increased. The principle upon which the system is operated is induction. The receiving instruments or phones respond only to induced currents of high tension, thrown upon the line by suitable transmitting devices. These currents interfere in no way with the Morse instruments on the same circuit, being made to pass round them through condensers. This system can be operated upon circuits not exceeding ab. 100 miles.

Phoranthium. See CLINANTHIUM.

Phormion, 5th cent. B.C. Athenian general, prominent at Potidea, Naupactus, and in other battles.

Phormis, 5th cent. B.C. One of the originators of Doric comedy.

Phoronomy. See ZOÖLOGY.

Phosgene. $COCl_2$. Carbonyl chloride; yellowish gas, formed by the union of carbon monoxide with chlorine in the sunlight; used in the preparation of certain organic compounds; often sold in solution in benzene. Treated with ammonia it yields urea.

Phosphate Rock. Rock containing calcium phosphate in such quantity and in such chemical combination as to be available for use in the manufacture of fertilizers. In different localities the deposits differ widely in physical and in chemical properties, and only a small part of the rock mined is of use to the agriculturist, with previous chemical treatment. Some phosphates are clearly of mineral origin, as rock containing apatite; but the larger deposits, those from which the commercial demand is met, owe their existence, directly or indirectly, to accumulations of animal remains. In recent years a great part of the world's supply has been drawn from S. C. and Fla. In 1895, 831,498 tons, value $2,577,643, were produced in U. S.

Phosphates. Derivatives of phosphoric acid.

Phosphatic Diathesis. Habit of a body which favors the deposition of the phosphates from the urine.

Phosphides. Compounds formed by the union of phosphorus and some other element: *e.g.*, zinc phosphide, Zn_3P_2.

Phosphine. $C_{19}H_{16}N_4O_3$. Diamidophenylacridinehydrochloride; by-product in fuchsine making; orange powder, soluble in water. It dyes cotton yellow upon a tannin mordant, and is not to be confounded with the gaseous phosphine, PH_3. See PHOSPHURETED HYDROGEN.

Phosphines. Compounds formed by replacing the hydrogen of phosphoreted hydrogen (PH_3) by organic groups or radicals. Examples: $PH_2.CH_3$., methyl phosphine. $PH:(C_2H_5)_2$, diethyl phosphine.

Phosphites. Derivatives of phosphorus acid.

Phosphomolybdates. Metallic derivatives of phosphomolybdic acid.

Phosphomolybdic Acid. Various in composition; the ordinary form has the formula $H_3PO_4.11MoO_3+12H_2O$. Ammonium phosphomolybdate is its most important derivative.

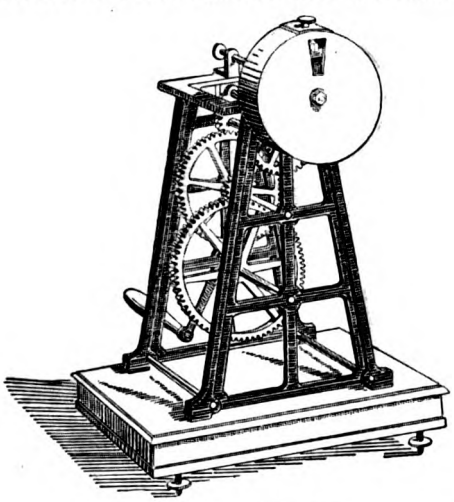
Phosphonium Bromide. PH_4Br. Colorless, transparent cubes, very hygroscopic; unstable; made by treating phosphine with gaseous hydrobromic acid.

Phosphonium Chloride. PH_4Cl. Small lustrous needles, obtained by subjecting equal volumes of phosphine and hydrochloric acid gas to 2.7 atmospheres pressure at 2.2° C.; more unstable than the corresponding bromide or iodide.

Phosphonium Iodide. PH_4I. Transparent cubes, formed by the action of phosphine on hydriodic acid.

Phosphor Bronze. Alloy more resistant to abrasion than the ordinary bronzes for bearings and journal brasses, and more infusible after being cast for tuyeres and other such uses, made by fluxing bronze with phosphorus, and containing less than one per cent of this. Invented by a Belgian engineer 1870. See COPPER, METALLURGY OF.

Phosphorescence. Power in certain substances of appearing self-luminous when viewed in the dark, after being exposed for a time to the action of any luminous radiation. The phenomenon is supposed to be due chiefly to the action of rays of rather high refrangibility. The sulphides of calcium and of barium are notably phosphorescent. In many cases the phosphorescence is of short duration; for the examination of



Becquerel's Phosphoroscope

such Becquerel's phosphoroscope may be employed. This consists of a device by which in rapid succession a phosphorescent body is exposed to bright light and brought against a dark background before the eye of an observer situated in darkness. Most substances are found to be phosphorescent when examined in this way. The rays of light which generate phosphorescence are called phosphorogenic rays.

Phosphorescent Clouds. Very delicate, silver-white clouds, seen in Europe in June and July, even at midnight, during the short nights. Simultaneous photographs show that these are from 10 to 15 m. high and probably shine by reflecting distant twilights.

Phosphorescent Organs. Present on the ventral side of the abdominal segments, and sometimes in other parts of the body of insects; also on the sides of deep-sea fishes. The cells of these organs produce light under nervous stimulation of a trophic character. Examples are glow-worm, fire-fly and certain marine animals.

Phosphoreted Hydrogen, or PHOSPHINE. PH_3. Sp. gr. 1.2. It was discovered by Gengembre 1789. Ignes fatui is thought to be due to it. Poisonous, colorless, slightly soluble gas, of an unpleasant, garlic-like odor, usually spontaneously inflammable; made by heating phosphorus in a solution of caustic potash. It does not take fire in the air when pure. Liquid phosphine has the formula P_2H_4, and solid phosphine P_4H_2.

Phosphoric Acid, or ORTHOPHOSPHORIC ACID. H_3PO_4. The anhydrous acid consists of hard, colorless prisms, which rapidly absorb moisture from the air, forming a thick liquid. It is made by dissolving phosphorus pentoxide in hot water, or by treating phosphorus with nitric acid; it is tribasic, yielding primary, secondary, and tertiary salts by replacement of one, two, and three hydrogen atoms respectively. Glacial phosphoric acid is the more common commercial form: it is METAPHOSPHORIC ACID (q.v.). When heated to 200°–300° C., it is converted into pyrophosphoric acid; heated to 400° C., it yields metaphosphoric acid.

Phosphorite. Fibrous, massive, or concretionary forms of APATITE (q.v.).

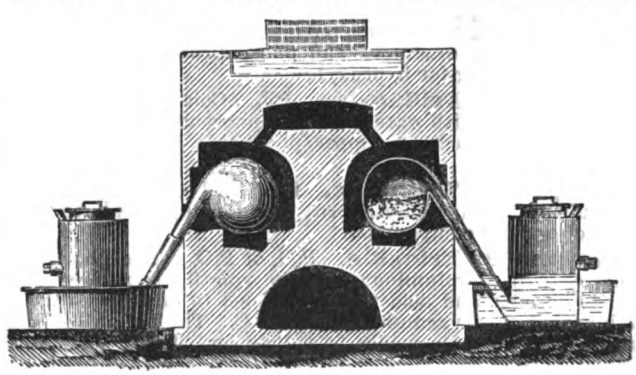
Phosphorogenic Rays. See PHOSPHORESCENCE.

Phosphoroscope. See PHOSPHORESCENCE.

Phosphorous Acid. H_3PO_3. Transparent crystals, made by treating phosphorus trichloride with water; converted into phosphoric acid by heat; dibasic acid.

Phosphor Tin. Brittle, white substance, composed of tin and phosphorus in varying proportions; sp. gr. 6.56; soluble in hydrochloric acid; made by throwing phosphorus upon melted tin, or by melting equal parts of tin and phosphorus pentoxide together; used in making phosphor bronze.

Phosphorus. P. At. wt. 31, sp. gr. 1.83, sp. ht. .202, mpt. (under water) 44° C., bpt. 290° C., valence III., V. Discovered by Brand 1669; waxy, transparent, yellow substance. It does not occur in nature, on account of its great affinity for oxygen; on exposure to the air at ordinary temperatures it takes fire. It is made by calcining bones, then treating with sulphuric acid, when this reaction takes place: $Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. This primary phosphate is heated and converted into the metaphosphate. $CaH_4(PO_4)_2 = Ca(PO_3)_2$



Distillation of Phosphorus.

$+ 2H_2O$. It is then distilled with carbon and silica, and condensed under water. $2Ca(PO_3)_2 + 10C + 2SiO_2 = 4P + 10CO + 2CaSiO_3$. When taken into the stomach, it is poisonous, as are its vapors. It must be handled with the greatest care, since it takes fire readily and causes serious wounds. It occurs in several allotropic forms. See PHOSPHORUS, AMORPHOUS, and PHOSPHORUS, CRYSTALLIZED. It is insoluble in water, but soluble in carbon disulphide. It is used in making matches and as a poison for vermin.

Phosphorus, AMORPHOUS. Made by heating ordinary phosphorus to 300° in a sealed tube; dark red powder, insoluble in carbon disulphide. It does not emit light, and is not poisonous. Heated to 261° C. it is converted into the ordinary variety. It is used for making safety matches, being applied to the box.

Phosphorus, CRYSTALLIZED. Metallic phosphorus. If ordinary phosphorus is heated with lead for ten hours in a sealed tube from which the air has been exhausted, on cooling, black crystals are found. They undergo no change in the air.

Phosphorus Hydrides. See PHOSPHORETED HYDROGEN.

Phosphorus Oxychloride. $POCl_3$. Clear, fuming liquid, made by treating phosphorus pentachloride with hydroxyl compounds. Treated with water it yields phosphoric and hydrochloric acids.

Phosphorus Pentabromide. PBr_5. Yellow, crystal-

line solid, made by adding bromine slowly to phosphorus tribromide.

Phosphorus Pentachloride. PCl_5. Solid, crystalline, yellowish, fuming compound, made by treating phosphorus trichloride with chlorine. It sublimes without fusion. It is used as a reagent for testing for the presence of hydroxyl and for introducing chlorine into hydroxyl compounds.

Phosphorus Pentafluoride. PFl_5. Colorless, strongly fuming gas, with a marked odor; made from arsenic trifluoride and phosphorus pentachloride.

Phosphorus Pentaselenide. PSe_5. Dark-red, glassy substance, crystallizing from carbon tetrachloride in black needles, decomposing in moist air; made by heating phosphorus and selenium in a carbon dioxide atmosphere.

Phosphorus Pentasulphide. P_2S_5. Grayish-yellow crystalline mass, or thin, almost colorless crystals; mpt. 274°–276° C., bpt. 530° C.; soluble in caustic alkalies and ammonium hydroxide; made by heating phosphorus (2 at.) and sulphur (5 at.) together in an atmosphere of carbon dioxide.

Phosphorus Pentoxide. P_2O_5. Phosphoric anhydride; white powder, becoming glassy on fusion; odorless, with a strong acid taste, sublimable; extremely hygroscopic, therefore used extensively as a dehydrating agent; formed by burning phosphorus in a free supply of air or in oxygen; very soluble in water, forming PHOSPHORIC ACID (q.v.).

Phosphorus Sulphobromide. See PHOSPHORUS SULPHOCHLORIDE.

Phosphorus Sulphochloride. $PSCl_3$. Colorless, strongly refractive, mobile, fuming liquid of unpleasant odor. It dissolves sulphur and phosphorus. It is made by heating phosphorus with sulphur monochloride, S_2Cl_2. The corresponding bromine and fluorine products are very similar in properties and are made in the same general way.

Phosphorus Sulphofluoride. See PHOSPHORUS SULPHOCHLORIDE.

Phosphorus Tribromide. PBr_3. Colorless liquid; bpt. 175° C., sp. gr. 2.7; made by treating phosphorus with bromine; used in the synthesis of organic compounds.

Phosphorus Trichloride. PCl_3. Fuming, colorless liquid, of a sharp, penetrating odor; sp. gr. 1.61; made by passing chlorine over gently heated phosphorus; decomposed by water, forming hydrochloric and phosphorus acids; used as a reagent for testing for hydroxyl.

Phosphorus Trifluoride. PF_3. Colorless, non-fuming gas, decomposes with water into phosphorous and hydrofluoric acids; made by heating copper phosphide, Cu_3P_2, with lead fluoride.

Phosphorus Triiodide. PI_3. Red crystals; mpt. 55° C.; made by treating phosphorus with iodine; used in the synthesis of organic compounds.

Phosphorus Trioxide. P_2O_3 or P_4O_6. Phosphorus anhydride; white, voluminous, easily volatile substance of a garlic-like odor and acid taste, obtained in large crystals by sublimation in a vacuum; mpt. 22.5° C. The action of light causes it to change rapidly to yellow and finally red. It is formed by the incomplete combustion of phosphorus in air.

Phosphorus Triselenide. PSe_2. Similar to the trisulphide; robin-red solid, taking fire in the air, soluble in caustic potash; made by fusing phosphorus with sulphur.

Phosphorus Trisulphide. P_2S_3. Grayish-yellow, crystalline substance; mpt. 167° C.; soluble in caustic alkalies and ammonium hydroxide; made by heating phosphorus and sulphur together in an atmosphere of carbon dioxide.

Photantitypimeter. Form of actinometer introduced by Marchand 1860, in which the solar radiation falls upon a quantity of chemicals and causes a slow disengagement of carbonic acid gas, whose volume is an index of the power of the solar rays.

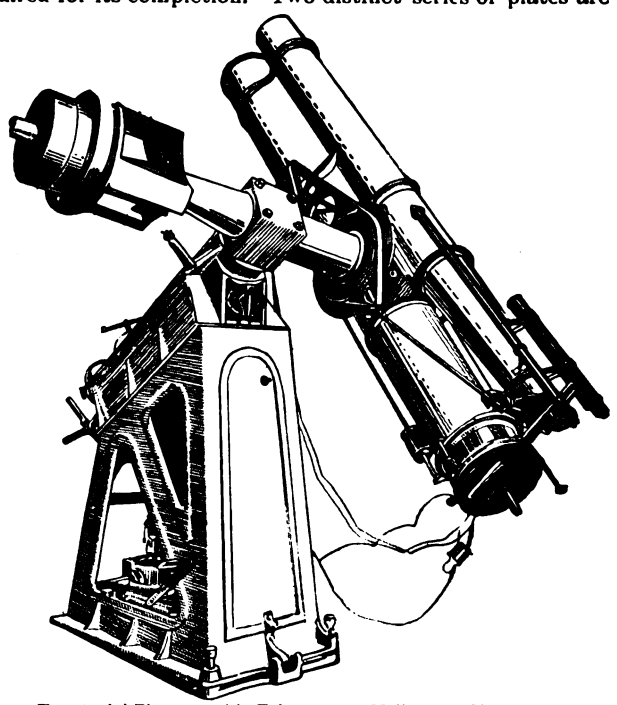
Photius, d. ab.891. Patriarch of Constantinople 861; great scholar, whose extensive works upon ancient literature, lexicography, and ecclesiastical history are of value, as rescuing from oblivion names and facts which would otherwise have perished in the destruction of the libraries of Constantinople and the East. He was involved in violent quarrels with Rome, and was deposed 867 and 886.

Photochromoscope. Instrument invented by F. E. Ives for viewing specially prepared photographs, known as chromograms, in such a way as to reproduce perfectly all the colors of the original object. The Ives method consists, first, of a reproduction, in a special camera, of a photograph consisting of three distinct images, which, by the differences in their light and shade, constitute a color record, each image, in fact, representing one of the three fundamental color sensations, red, green, or blue-violet; and second, of viewing this triple photograph in the photochromoscope, which is practically a reversal of the camera, and blends the three images into one so perfectly that one seems to be viewing the object itself.

Photo-Engraving. From a silver collodion negative a gelatin positive is made, from which a bitumen mold on glass is prepared. From the latter a plaster-of-Paris mold is made, in which type-metal is cast. From this impressions in ink on paper are made. This is the Moss method. Another process, more commonly used, is to expose to the light a gelatin plate, sensitized with potassium bichromate, beneath a collodion negative. The unaffected gelatin is dissolved by water and the film transferred to a polished zinc or copper plate, which is then treated with an etching liquid, the former with nitric acid, the latter with perchloride of iron. The film is also produced directly upon the metal plate. It is also produced by exposing to the light, under a silver negative, a plate coated with bitumen, the unaffected bitumen being dissolved by turpentine. In these processes, the silver negative is made from a line drawing. When a picture with gradation of color is to be reproduced, a transparent screen, with network of black lines upon it, is interposed between the negative and the sensitized plate, upon which fine dots are thus produced. This is the half-tone process. See PHOTOGRAVURE.

Photographic Object-Glass. Object-glass so formed as to bring the actinic rays of the spectrum to a common focus, instead of the visual rays.

Photographic Survey OF THE HEAVENS. April 16, 1887, by invitation of Admiral Mouchez, an international congress assembled at Paris for the purpose of considering plans for a photographic survey of the entire heavens on a uniform system. The scheme then inaugurated involved apportioning the work among different observatories, the construction of special instruments, and the settlement of innumerable questions of detail, to insure uniformity. All this required time; the work is now fairly under way, but many years will be required for its completion. Two distinct series of plates are to



Equatorial Photographic Telescope at Melbourne Observatory.

be taken: 1, a series with sufficiently long exposure to show all stars to the 11th magnitude inclusive, for the formation of a catalogue; 2, a series with long exposure, 40 minutes, for purposes of a chart. The work has been distributed among 18 observatories, but does not include a single observatory of the U. S. On the other hand, an independent photographic survey is being conducted at the Harvard College Observatory with a splendid instrument of 24 in. aperture, the intention being to obtain with this single instrument a chart of the entire heavens.

Photography. Art of producing pictures by light on sensitized surfaces. In 1802 Wedgwood, in England, on paper moistened with a solution of silver nitrate, reproduced a design on translucent paper laid upon it and exposed to light. Davy found that silver chloride was more sensitive. In 1814 Niepce discovered that an asphaltum film on metal or glass, exposed to light under a drawing, was rendered insoluble in oil of lavender and petroleum. He thus produced pictures in

a camera obscura which he named Heliographs. He became associated with Daguerre 1829. The latter, in 1839, invented the DAGUERREOTYPE (q.v.). The Callotype was patented by W. H. Fox Talbot 1841. Paper sensitized with silver iodide, after exposure in a camera, was developed by silver nitrate and gallic acid, the unaffected silver salt being removed by sodium thiosulphate, a suggestion of Sir John Herschel. The paper was then waxed to render it translucent, and constituted a negative, which was exposed to light upon similarly prepared paper to produce a positive. Sir John Herschel suggested the use of glass plates. Niepce Saint-Victor introduced the use of egg albumen containing the silver salts for coating glass negatives and paper positives.

The collodion process was invented by Scott Archer of England 1851. Pyroxyline is dissolved in alcohol and ether, containing cadmium and potassium iodides, and with this a glass plate is coated. This is dipped in a water solution of silver nitrate, which produces silver iodide in the film. After exposure in the camera, the picture is developed by a solution of ferrous sulphate or pyrogallic acid which causes a deposition of metallic silver where the light has acted, thus producing a negative. The unaffected silver salts are removed by a water solution of sodium thiosulphate. The paper for the positives contains salt and is sensitized with nitrate of silver, producing silver chloride. This is exposed to the light under the negative, which reduces the silver salts to metallic silver, producing a positive. This is toned or colored in a water solution of gold chloride, the unaltered silver salts dissolved by sodium thiosulphite and thoroughly washed.

The gelatin dry plates are made of an emulsion of gelatin in water, with silver chloride, bromide, or iodide, dried upon glass plates. The emulsion was used successfully 1871 and the dry plates ab.1878. They are used and treated similarly to the collodion plates. Orthochromatic and isochromatic gelatin dry plates contain small quantities of eosin or other coal-tar dyes and reproduce the true shade relations of colors; they were first made by Vogel 1873.

Color photography, reproducing colors, has not yet been effected; Gabriel Lippman of Paris claimed to have accomplished this in 1891, but no valuable results have been obtained.

Color printing has been accomplished by plates made by interposition of a red, green, or blue-violet screen in the camera, which permits the passage of the respective rays. By superprinting with the respective pigments the original colors can be obtained. See FERROTYPE, BLUE-PRINTING and PLATINOTYPE.

AMBROTYPE.—This is silver negative on glass with a black background of paper or cloth.

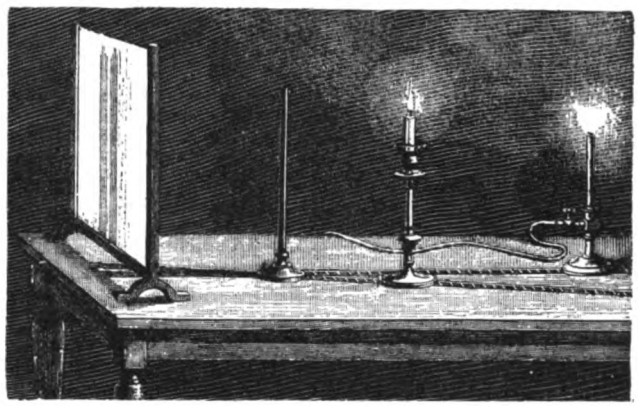
ARTOTYPE.—A glass plate is coated with albumen and potassium bichromate, dried at 110° F., and the albumen rendered insoluble by exposure to light. It is then coated with gelatin and potassium bichromate, dried at 110° F., and coated with gelatin, isinglass and ammonium bichromate, with a small addition of chrome alum and potassium bicarbonate, and dried as before. The plate is then exposed under the negative, by which the transmitted light renders the gelatin insoluble. It is now immersed in water to remove the unaltered bichromates. Paper prints are made from this in the lithographic press, the ink adhering only to the altered gelatin. Two thousand impressions have been taken from a plate. This process was perfected by Joseph Albert of Munich, and is sometimes called the Heliotype, Photogelatin, and ALBERTYPE (q.v.).

Photogravure. In making a plate for this process, a silver collodion positive on glass is made from a silver collodion negative on glass. A gelatin film, containing lampblack and sensitized with potassium bichromate, on tissue paper, is exposed to the light under the positive. The resulting negative is laid, face downward, on a copper plate, coated with rosin, and the paper stripped off, leaving the gelatin film attached to the copper plate. This is treated with hot water, which dissolves the gelatin which has not been affected by the light, leaving a gelatin negative on the plate. This is then treated with perchloride of iron, which etches the copper, more or less, according to the thickness of the gelatin, thus reproducing a positive on the copper. This is frequently finished by handwork and then steel faced by an iron solution to increase its durability. Prints are made on paper from this in a copperplate press.

Photolithography. A film of bichromatized gelatin on paper is exposed to light under a negative and the unaltered bichromate washed out with water. The film is then inked with greasy printers' ink, which adheres only to the gelatin rendered insoluble by light. This is laid face downward on the lithographic stone, upon which it is pressed, thus transferring the ink to the stone. The paper is removed by rubbing with water. A water solution of gum arabic fills the pores of the uninked stone. The picture in ink is thus left upon the stone to which printers' ink adheres and may be transferred to paper in the press.

Photo-Mechanical Printing (WOODBURYTYPE). A layer of gelatin sensitized with potassium bichromate is exposed under a negative and the unaltered gelatin dissolved in warm water, leaving a gelatin relief. This is impressed in a sheet of lead, thus forming a mold. This is filled with colored gelatin, covered with paper and a glass plate and pressed. The gelatin cast adheres to the paper and is hardened by alum solution. The Stannotype, also invented by Woodbury, is made in a similar manner, a carbon gelatin mold being lined with tinfoil. In the Phototype, Heliotype and Collotype processes the gelatin relief is printed from with printers' ink. See AUTOTYPE.

Photometer. Instrument for comparing the illuminating powers of two sources of light. The two lights are placed at such distances from the illuminated surface as to produce the same effect, as judged by the eye. In Rumford's photometer a vertical rod casts two shadows on a screen; the distances are so adjusted that the illumination of these shadows shall be



Rumford's Photometer.

equal; the illuminating powers of the sources are then proportional to the squares of their distances from the screen. In Bunsen's the sources of light are placed at such distances on opposite sides of a translucent disk, having on it a paraffined spot, that the illumination, as viewed from each side successively, appears to be the same. The same law of distance applies in this case also.

Photometer, MERIDIAN. Designed by Pickering. The instrument is mounted in the meridian with appliances so arranged that the light of each star as it culminates may be compared with that of Polaris.

Photometer, POLARIZING. The light is passed through a Nicol's prism with apparatus so arranged that by turning the prism the light may be reduced to the same brightness shown by a standard star in the same field. The latter may be a real star or an artificial one.

Photometer, WEDGE. The important feature is a wedge of colored or neutral-tinted glass: the star's light is measured by the thickness of the wedge necessary to extinguish it.

Photometry. Science of measuring and comparing the relative amount of light emitted by different sources. The methods generally consist in measuring the distances at which two sources produce equal intensities of illumination. Hence by the application of the law of inverse squares the ratio of the quantities of light emitted can be determined. The unit in photometric measurement is the quantity of light emitted by a standard candle. This is a spermaceti candle, six to the pound, each burning 120 grains per hour. The Paris Electrical Standards committee in 1884 recommended as the unit the light emitted by one square centimeter of melted platinum at its temperature of solidification.

Photometry, STELLAR. Measurements of the amounts of light, or relative brightness, of stars.

Photonephograph. Apparatus (consisting essentially of twin cameras adjustable at any angle of elevation and azimuth) for taking simultaneous photographs of a cloud as seen from two points on the earth; so named by Abney 1883.

Photophone. Crystalline selenium when acted upon by light increases in electric conductivity, sometimes even tenfold. Light of varying intensity produces corresponding changes of conductivity. The photophone is constructed on this principle.

Photosphere OF THE SUN. Luminous mass which forms the visible disk. It consists of a mass of luminous clouds floating in the sun's atmosphere.

Phototachy, METRICAL. Method of determining the sun's distance by direct measurement of the velocity of light, and of the time which it requires to pass from the sun to the earth.

Phototaxis. Habit of certain organisms of placing themselves in definite positions with reference to the incident rays of light, as in the zoöspores of some *Algæ*.

Phototonic. Action of light upon certain plants, increasing or inducing irritability.

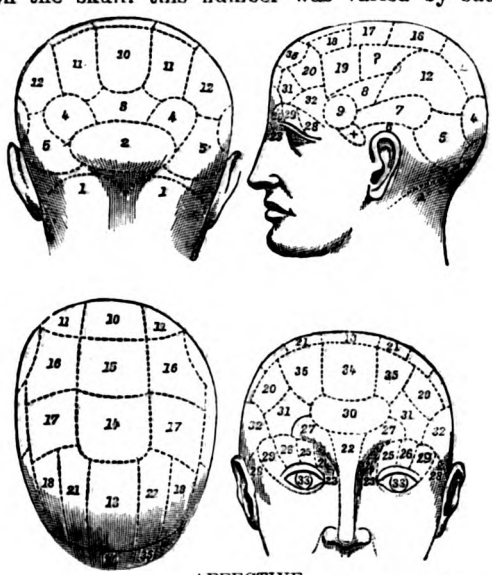
Photozincograph. See PHOTO-ENGRAVING.

Phragma. Membrane stretched across the hollow stems of the *Equisetaceæ* at each node; also dissepiments of certain fruits.

Phragmacone. Chambered portion of the internal shell of a BELEMNITE (q.v.).

Phranza, GEORGE, 1401–1478. Byzantine historian. His *Chronicon*, written after the fall of Constantinople and pub. 1796, extends 1259–1477.

Phrenology. So-called system of psychology, founded by GALL (q.v.) and developed by his followers. At one time it had considerable popularity, but has now fallen into disrepute. It was based upon four principles: 1. The brain is the organ of mind. 2. The mental powers can be analyzed into a definite number of independent faculties. 3. These faculties are innate, and each has its seat in a definite region of the brain. 4. The size of each of these regions is proportionate to the power of manifesting the faculty associated with it. Gall divided mind into 26 faculties, and mapped out a corresponding number of areas on the skull: this number was varied by succeeding



AFFECTIVE.

I. PROPENSITIES.—1. Amativeness; 2. Philoprogenitiveness; 3. Inhabitiveness or Concentrativeness; 4. Adhesiveness; 5 Combativeness; 6. Destructiveness and Alimentiveness; 7. Secretiveness; 8. Acquisitiveness; 9. Constructiveness. II. SENTIMENTS.—10. Self-esteem; 11. Love of Approbation; 12. Cautiousness; 13. Benevolence; 14. Veneration; 15 Firmness; 16. Conscientiousness; 17. Hope; 18. Wonder; 19. Ideality; 20. Wit; 21. Imitation.

INTELLECTUAL.

I. PERCEPTIVE.—22. Individuality; 23. Form; 24. Size; 25. Weight; 26. Coloring; 27. Locality; 28. Number; 29. Order; 30. Eventuality; 31. Time; 32. Tune; 33. Language. II. REFLECTIVE.—34. Comparison; 35. Causality.

phrenologists, the maximum number of faculties and areas, 43, being reached by Fowler of New York. The objections to this system are many and unanswerable. Psychologically, the division of mind into a number of independent faculties is admittedly impossible, while the mapping out of sharply defined areas of the brain which can be determined by external examination of the skull has been shown by the modern researches in brain physiology to be in direct opposition to the facts. At the same time there is localization of brain function, and Gall's system of phrenology must be given the credit of being the first systematic attempt on empirical lines to determine its details.

Phryganidæ. See TRICHOPTERA.

Phrygia. Region of central Asia Minor, whose limits varied at different times. The original inhabitants were probably Thracian. The earliest Greek music came in part hence.

Phrygian Language. Only known by glosses and inscriptions, and was probably an Indo-European tongue, closely related to the Armenian.

Phryne, 4th cent. B.C. Bœotian courtesan, famous for her beauty; said to have been painted by Apelles, and copied in Praxiteles' Cnidian Venus.

Phrynichus, 5th cent. B.C. Attic tragic poet.

Phrynichus, ARABIUS, 2d cent. Greek rhetorician and grammarian.

Phrynidea. See PEDIPALPI.

Phthaleins. Compounds formed by heating phenols with phthalic anhydride. See FLUORESCEIN. The simplest member of the class is phenol phthalein.

Phthalic Acids. $C_6H_4:(COOH)_2$. Dicarboxyl derivatives of benzene; known in three forms: the ortho-, called phthalic acid, the meta-, called isophthalic acid, and the para-, called terephthalic acid. The ortho acid is prepared by the action of oxidizing agents on tetrachlornaphthalene. It crystallizes in short prisms or plates; mpt. 184° C.; soluble in alcohol and water. On heating it is converted into the anhydride. It is used in the manufacture of phthalic anhydride.

Phthalic Anhydride. $C_6H_4(CO)_2O$. White solid, crystallizing in magnificent prisms, melting at 128° C.; prepared by heating orthophthalic acid, and used in preparing the phthaleins. See FLUORESCEIN and EOSIN.

Phthiotis. S.e. Thessaly; birthplace of Achilles.

Phthisis. Any wasting disease, but now usually applied to a disease destroying the tissue of the lung and, for the most part, synonymous with pulmonary consumption. The disease is caused by the ravages of a microphyte, the bacillus of tuberculosis (Koch's bacillus). The disease when well established usually results fatally, and more deaths are attributed to this than to any other single cause. Since its cure is so difficult, especial pains should be taken to prevent its spread. The prevention of the diffusion of the bacilli by disinfecting the expectoration of a consumptive and all with which it comes in contact should be carefully attended to. Then there should be personal care of one's health, so as to resist the onslaught of any of the bacilli that may find lodgment in the lungs. See BACILLUS TUBERCULOSIS, KOCH'S LYMPH, and CONSUMPTION.

Phycochromaceæ. See CYANOPHYCEÆ.

Phycocyanin. Characteristic bluish-green pigment contained in the cells of the *Cyanophyceæ*. It is soluble in hot water.

Phycoerythrine. Red soluble coloring matter contained in the *Florideæ* (*Rhodyphyceæ*) or red *Algæ*.

Phycology. Study of seaweeds; Algology.

Phycomycetes. Sub-class of *Fungi*, mostly unicellular or cœnocytic organisms with both sexual and asexual modes of propagation, including many of the moulds.

Phycophæin. Reddish-brown substance obtained from certain of the olive-brown seaweeds.

Phycoxanthin. Yellow substance obtained in alcoholic solution from the olive-green seaweeds and diatoms.

Phylactery. Small square box, inclosing certain texts, worn by the Jews during the hours of morning prayer, on a literal interpretation of Exod. xiii. 9, 16.

Phylactolæmata (LOPHOPODA). Ectoproctous *Bryozoa* with epistome and a horseshoe-shaped lophophore. They are all (except *Rhabdopleura*) fresh-water forms, colonial, and without polymorphism. *Cristatella* lives as free-moving colonies; *Plumatella* as fixed colonies.

Phylæ. Attic tribes; at first 4, then 10, finally 12.

Phylarchus, 3d cent. B.C. Historian of Greece 280–220 B.C. Fragments of his work survive.

Phyllidiobranchia. In this group of Opisthobranchs the ctenidia are aborted, and special gills are symmetrically developed from the mantle. See TECTIBRANCHIATA.

Phyllirhoë. Nudibranch belonging to the sub-group GYMNOBRANCHIA (q.v.).

Phyllite. Old name given to clay slate or argillaceous schist.

Phyllocladia. Branches which imitate leaves, and in many cases perform the functions of leaves, as with Cacti.

Phyllocyanin. Greenish-blue substance, obtained from the alcoholic solution of chlorophyll by the action of ether and hydrochloric acid.

Phyllocysts. Cavities in *Hydrophyllia*.

Phyllodium. Leaf-like organ developed from the sides of a petiole, as in many Acacias.

Phyllody. Transformation of floral organs to leaves.

Phyllome. Modified leaves, especially those which perform other than their normal functions.

Phyllophore. Leaf-bearing organs.

Phyllopoda (BRANCHIOPODA). Crustaceans with elongated, segmented body, with numerous, lobed, biramous, leaf-like feet, usually absent on the posterior segments of the abdomen, except the terminal one, where a caudal fork is often present. The posterior pair of antennæ act often as locomotor organs. Some forms have a flat carapace, others have a laterally compressed bivalved shell. Some species produce parthenogenetic summer generations. There are two sub-orders, *Branchiopoda* and *Cladocera*.

a, Sea hare (*Branchipus grubei*), male; *b*, female; *c*, Brine shrimp (*Artemia salina*), male.

Phyllopodium. Petiole of a simple leaf, or petiole and rachis of a compound leaf.

Phyllorhina. Tribe of *Microcheiroptera*, characterized by having cutaneous appendages spread on the nose, consisting of a horseshoe-shaped anterior leaf, a medium saddle, and a posterior, vertical, lancet-shaped leaf. The RHINOLOPHIDÆ, MEGADERMIDÆ, and PHYLLOSTOMIDÆ (q.v.) are the families included.

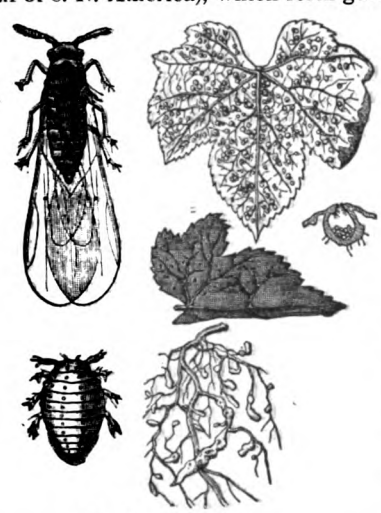
Phyllosiphoneæ. Family of minute green *Algæ* of the order *Siphonaceæ*, occurring within the tissues of other plants.

Phyllostomidæ. See BATS.

Phyllotaxy. Study of arrangement of leaves on a stem.

Phylloxanthin. See XANTHOPHYLL.

Phylloxera. Genus of plant lice of ab. 20 species (nearly all of e. N. America), which form galls on various plants, principally on the leaves. *P. vastatrix* of the grape mainly attacks the roots. It was first found in N. America 1854, and was first described by two American entomologists, Asa Fitch and C. V. Riley 1871. It had previously been introduced into France 1863, where the mild winters favored its development; as a result the vines succumbed, being less resistent than those of America, which have become habituated to this parasite. By 1874 the French Government, thoroughly alarmed, offered 300,000 francs for a remedy. The measures that have proven most practical have been the enforcement of quarantine regulations against infected districts, and the introduction of hardy American stock. In 1890, more than 700,000 acres had been replanted with American vines. This pest has also been introduced into California. The biology of Phylloxera is most interesting: these lice are so small as to be barely visible, and produce generation after generation of wingless (larval) parthenogenetic females in the root galls. About midsummer the generations become winged and appear above ground, laying eggs of two sizes on the leaves. The large eggs hatch into true females, the small ones into males; both sexes are mouthless, and have only the function of laying fertilized eggs, one from each female. Those laid late in fall rest until spring, but the earlier ones hatch in a short time into prolific, agamic females, that start the cycle over again. If the winters are cold, the larvæ hibernate. On some vines the agamic generations are produced in leaf-galls instead of root-galls. Carbon bisulphide, potassium sulphocarbonate and emulsions of petroleum are applied to the vines.



Life-history of Phylloxera.

A winged female; a wingless female from the root; under surface of a vine-leaf, showing the wart-like galls; an enlarged section of one of the galls, showing the eggs within it; upper surface of a vine-leaf, showing the openings of the galls; some of the roots of the vine, showing the nodosities caused by the parasites.

Phylogenetic Variation. Congenitally acquired improvements of the characteristics inherited by an organism from its ancestors, provided such improvements are transmitted to posterity.

Phylogeny (PHYLOGENESIS). Race development; or, most broadly, the development of the different species, genera, families, orders, classes, etc., of organisms, according to the evolutionary view, from the simple and original parent species. The species of a genus are more nearly related and have more recent ancestors than species of different genera, and these in turn than species of different families, and so on. Compare ONTOGENY.

Phylum. Branch or large division in a system of classification of organisms.

Phyogemaria. Small gonoblastidia of the siphonophore *Velella*.

Physalidæ. Sub-order of the Siphonophores, characterized by possessing a very large pneumatocyst (as in the Portuguese man-of-war), with no nectocalyces or hydrophyllia, but with clusters of large and small nutritive polyps, and with gonophores on the ventral side of the sac; also with very long and strong tentacles. The female buds become free medusæ.

Portuguese Man-of-war (*Physalia pelagica*).

Physeteridæ. See CATODONTIDÆ.

Physic, INDIAN. Perennial white-flowered herbs of the genus *Porteranthus*, natural family *Rosaceæ*, natives of the e. U. S.

Physical Diagnosis. Method of investigating the nature of a disease by the aid of the senses of the examiners as distinguished from the symptoms detailed by the patient.

Physical Education. This is the system of gymnastics, for the training of muscles of the human body and its consequent healthy development. Throughout all time the strengthening of the body, as a means of defense and attack, was necessary for self-preservation. The early Greeks were skillful with weapons of war and later extended their training, which resulted in the noted GREEK GAMES (q.v.). These were replaced by exhibitions of skill by their slaves. The Romans closely followed the Greeks in their athletics. In the Middle Ages exercise was practiced for its usefulness in war. In the 17th and 18th centuries some efforts were made to encourage gymnastics. Early in the present century JAHN (q.v.) organized gymnastic societies in Germany and invented much of our modern apparatus, and is considered the founder of the modern system, which has extended to U. S. and other countries. The Swiss system of Clias was introduced in France, Italy and England. Ling invented the Swedish system, which begins with simple movements, gradually extending these to more complex exercises. England developed the sports and games. In U.S. gymnasiums were established by schools and colleges on the German plan. The Harvard system was originated by Dr. Sargent in 1869 and consisted of the use of developing apparatus, regulated for the individual, the movements being the Swedish. ANTHROPOMETRY (q.v.) is used to guide the exercise. More than 1,000 such gymnasiums have been built in U.S.

Physical Geography. See GEOGRAPHY, PHYSICAL.

Physicians, ROYAL COLLEGE OF. Founded in London 1518; that of Edinburgh 1617, chartered 1681. Salerno was already termed the Hippocratic City in 9th century. The Arabian medical authors began to be known in Europe through translations ab. 1050.

Physick, PHILIP SING, M.D., 1768–1837. Prof. Univ. Pa. 1805–31; "father of American surgery."

Physic Nut. Fruit of *Curcas purgans*, found in the E. Indies. It is a small bush with a milky juice; the seeds yield an acrid oil, called Jatropha-oil, used as a purgative, and in lamps.

Physics. That department of science which treats of matter in its relations to energy. It investigates the phenomena and properties of matter and energy, states the results in terms of some definite measurement, and explains them according to certain principles or laws, regarded as the laws of nature. It was formerly called Natural Philosophy. It includes Mechanics, Gravitation, Cohesion, Elasticity, Acoustics, Optics, Heat, Electricity and Magnetism; the properties of masses and molecules.

Physiocrates. School of economists in France in 18th century. They considered agriculture as the only truly productive industry, and advocated a single tax laid upon land.

Physiognomy. Determining of qualities of mind by external marks, which in primitive conditions we find attempted as a magical and divinatory, rather than a rational process. Thus in China the physiognomist practices his art in connection with palmistry and other methods of fortune-telling, and the various parts of the countenance are supposed to furnish an index for different years in a man's existence. A knowledge of the origin of the features is the necessary basis for a true physiognomy, which is gradually being developed by the aid of modern evolutionary science.

Physiography. Description of Nature. See MOUNTAIN STRUCTURE and OROGRAPHY.

Physiological Chemistry. Chemical principles as concerned in the life and structure of animals and plants.

Physiologus. Greek writing of great popularity in the Middle Ages and probably written at Alexandria in the second century. It described all the animals of creation, real or fabled, and was illustrated by drawings. It was valuable for the moral allegories it contained, and was translated into many languages.

Physiology. Science that investigates the functions of a living organism in a normal condition; if the function is perverted from the normal its investigation belongs to PATHOLOGY (q.v.). After the speculative period of the ancient Greeks, Hippocrates, the father of medicine, 450 B.C. was the first to attribute disease to natural causes and not to special visitations of the gods. Aristotle, the father of natural history, 350 B.C. dissected dead animals. Galen, A.D. 150 experimented with living animals, and investigated the blood and the nervous system. Harvey discovered the circulation of the blood 1616. Haller, the father of the science of physiology, made extensive contributions in the 18th century, and Muller in the first half of the present century broadened out the science. The invention of the microscope was a most important adjunct to progress.

Physiology, VEGETABLE. This discusses the functions of the organs of plants.

Physoclisti. Group of Teleostean fishes, having no ductus pneumaticus, and with the pelvic fins usually far forward under the breast. Here are included the *Lophobranchii*, *Plectognathi*, *Anacanthini*, and *Acanthopteri*. The two last groups, except *Pleuronectidæ* and *Pediculati*, but including also many Physostomes, are known as the *Teleocephali*. See TELEOSTEI.

Physograda. See SIPHONOPHORA.

Physophoridæ. Sub-order of the Siphonophores, characterized by a short stem (or long in *Agalmidæ*), having a terminal pneumatophore, beneath which usually are two or more rows of nectocalyces; then follow the polyps (nutritive and generative), and usually also dactylozooids and hydrophylia alternate regularly with them. Each polyp bears a long branched tentacle.

Physopoda, or THYSANOPTERA. Tribe of *Pseudo-neuroptera*, characterized by having a small, narrow, flat body, wings covered with hairs, and the mouth parts adapted for sucking. Thrips, frequenting the flowers of the chicory, is an example.

Physostomi (PHYSOSTOMATA, MALACOPTERI, CYCLOIDEI). Sub-order of Teleostean fishes, having soft fins, comb-like gills, and separated jaw-bones. The pelvic fins are abdominal in position when present. The swim-bladder always has a ductus pneumaticus. There are two sub-groups, the APODES and ABDOMINALES (q.v).

Phyto Chemistry. Chemistry of plants. It deals with the active principles of plants, the formation and transformation of their constituent parts.

Phytogeny. Study of the development of plants or their organs from pre-existent forms.

Phytography. Rules governing the description of plants.

Phytolaccaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 20 genera and ab. 60 species, widely distributed in the tropical and temperate regions of both hemispheres; called the Pokeweed family.

Phytolite. Fossil plant.

Phytology. See BOTANY.

Phytomastigoda. See ISOMASTIGODA.

Phytomer. Unit of structure; in more highly organized plants an internode, terminated by a node which bears one or more leaves; also termed Phyton.

Phytonomy. Plant physiology.

Phytopathology. Study of plant diseases.

Phytophaga. Tribe of *Terebrantia*, in which the larvæ feed on plants and resemble caterpillars, but with a greater number of abdominal feet. The adult has a sessile abdomen, which carries a short terebra in the Saw-flies, or Leaf-wasps, that deposit their eggs in the epidermis of leaves, and a long terebra in the Wood-wasps, that deposit in holes bored in wood by means of the ovipositor.

Phytophaga. See EDENTATA.

Phytophthires. Sub-order of *Rhynchota*, having two pairs of membranous wings (the female is usually apterous). The surface of the skin is often covered by a waxy deposit. The Bark-lice (*Coccidæ*), Plant-lice (*Aphidæ*), and Leaf-fleas (*Psyllidæ*) are included.

Phytotomy. Plant anatomy.

Piacenza. Old city of n. Italy, on the Po, 43 m. s.e. of Milan; founded 219 as Placentia; taken by Totila 546; sacked by Sforza 1447; joined to Parma 1545. It has some old and notable churches and palaces, and a town library of 120,000 vols. Pop. ab. 37,000.

Piacenza, DUKE OF. See LEBRUN, C. F.

Pia Mater. Innermost of the three coverings of the brain and spinal cord. It is a vascular net work lightly held together covering the entire surface. It sends arterial branches into the gray matter of the brain.

Pianoforte. An instrument of music consisting of a system of metal strings stretched over a resonance box, which are sounded by being struck with hammers covered with felt and manipulated by a keyboard. As an apparatus embodying all these principles, its history is compassed by less than two centuries; but the origin of each separate principle is lost in the darkness of antiquity. Immediate precursors of the pianoforte were the instruments used in the middle ages and till 1800, variously called clavecin, clavichord, clavicembalo, clavicymbalum, cembalo, gravicembalo, clavicytherium, virginal, spinet and harpsichord. There were differences of shape, size and efficiency in these instruments, but the principles of tone production were but two: The strings were sounded either by being snapped by bits of elastic material (quills, sole leather, etc.) placed in uprights called jacks and pushed past the strings by pressure on the keys; or by blows against the strings delivered by bits of brass, called tangents, with which the inner end of the keys were armed. The latter principle lies near to that of the pianoforte hammers, but the instruments in which it was employed (clavichord, clavecin) were feeble in tone and not adapted to the concert-room. There being no control of the dynamic intensity of the tones in the other instruments of which the highest type was found in the harpsichord, except by mechanical contrivances, musicians and instrument makers sought a remedy by changing the mode of tone production and hammers controlled by keys were the result. The priority of invention belongs to an Italian, CRISTOFALI or CRISTOFORI (q.v.), who produced an attachment to the harpsichord 1711 by which he could have tones *piano e forte*, at will. A Frenchman, Marius, and a German, Schrotter, seem to have arrived at similar results 1716–17.

Piarists. R. C. teaching order, founded 1599 by Joseph of Calasanza (1556–1648); confirmed 1617; most prominent in Austria and Poland.

Piassava. Coarse fibrous substance obtained from the Brazilian palm-trees *Leopoldinia piassaba* and *Attalea funifera*. It is used in making brushes for street sweeping.

Piast. Polish dynasty ab.850–1370.

Piastre. 1. Spanish "piece of eight" (reals), or silver dollar; worth ab. a U. S. silver dollar. 2. Italian scudo, worth

Spanish Piastre.

ab. 5 francs. 3. Small Turkish coin, worth ab. 4 cents; 1, 2, 5, 10, 20 piastres are also made.

Piatt, DONN, 1819–1891. American journalist. *Men who saved the Union*, 1887.

Piatt, JOHN JAMES, b. 1835. Poet and journalist; U. S. Consul at Cork 1882–94.—His wife, SARAH MORGAN (BRYAN), b. 1836, is also a poet.

Piazzi, GIUSEPPE, 1746–1826. Prof. of higher mathematics at Palermo 1780, where he founded an observatory and formed a valuable catalogue of 7,646 stars. On Jan. 1, 1801, he discovered the first of the Asteroids, Ceres.

Pi-beseth, or BUBASTIS. Ruined city on the Nile, notable for its remains of the 4th and later Egyptian dynasties.

Pibroch. Bagpipe music of the Scotch, chiefly of martial character: mainly recent, and all since 1594.

Picard, ALFRED, b. 1844. French engineer.

Picard, JEAN, 1620–1682. Founder of the Paris Observatory. He executed the first accurate measurement of an arc of a meridian, between Amiens and Malvoisin.

Picard, LOUIS BENOIT, 1769–1828. French actor and manager, author of many comedies. *Théâtre*, 9 vols., 1821–32.

Picardy. Former French province, between the English Channel and Champagne.

Picariæ. See SCANSORES.

Picayune. Spanish half-real or sixteenth of a dollar, long circulating in U. S.; so-called by the Caribs and in La.

Piccini, NICOLA, 1728–1800. Italian opera composer of many operas, whose rivalry with Gluck caused a musical war in Paris 1778.

Piccolo. Small FLUTE (q.v.), sounding an octave higher than the common flute.

Piccolomini, MARIA, b. 1834. Italian operatic singer, celebrated more for her charms of person than for voice or skill. She visited America 1858. In 1860 she married the Marquis Gaetain and retired.

Piccolomini, OTTAVIO, 1599–1656. General in the 30 Years' War, and for some years in Spanish service in the Netherlands; field marshal of the Empire 1648.

Pichardo y Tapia, ESTEBAN, 1799–1879. Cuban geographer and poet.

Pichegru, CHARLES, 1761–1804. French general, conqueror of Holland 1795; pres. Council of 500, 1797; deported for conspiracy. He escaped to England 1798, continued his intrigues, plotted with Cadoudal to murder Bonaparte, was arrested in Paris Feb. 28, 1804, and found dead in prison April 6.

Pichincha. Volcanic peak of the Andes, in Equador, altitude 15,918 ft. Beneath it Sucre defeated a Spanish force 1822.

Pichler, CAROLINE (GREINER), 1769–1843. Austrian novelist and playwright. *Agathokles* 1808; *Denkwürdigkeiten*, 4 vols., 1844.

Pichler, JOHANN, 1734–1791. German engraver, mostly of intaglios; in Rome from 1763.

Pichon, JEROME FRÉDÉRIC, BARON, 1812–1896. French author; pres. Societé des Bibliophiles from 1844.

Picidæ (PICOIDEÆ, PICI. CELEOMORPHÆ, SAUROGNATHÆ, WOOD-PECKERS). Group of Scansores, having strong, chisel-shaped, pointed beaks, without cere. The toes are strongly clawed; the tail is stiff, to assist in climbing. The tongue is long and horny, with hooks at its tip, and can be protruded a considerable distance, owing to the peculiar mechanism of the hyoid bone, whose horns arch up over the skull to the base of the beak. They feed on insects. Here also belong the Toucans and Wry-Necks.

Pick, ARNOLD, b. 1851. Prof. Prague 1886; writer on Neurology and Psychiatry.

Pickens, ANDREW, 1739–1817. Revolutionary officer, distinguished at Cowpens 1781; M.C. from S. C. 1793–95.—His grandson, FRANCIS WILKINSON, 1805–1869, was M.C. 1834–43, U. S. Minister to Russia 1858–60, and Gov. of S. C. 1861–62.—His cousin, ISRAEL, 1780–1827, was M.C. from N. C. 1811–17, Gov. of Ala. 1821–25, and U. S. Senator 1826.

Pickerel. See HAPLOMI.

Pickerel-Weed. Showy-flowered marsh plants of the genus *Pontederia*, natives of America.

Pickering, EDWARD CHARLES, b. 1846. Great-grandson of Timothy; prof. Mass. Inst. of Technology 1868–76; director of the Observatory at Harvard since 1876. Under his management it has reached a high state of efficiency. Besides much other valuable work, he has been conducting an extensive series of photometric and photographic investigations.

Pickering, TIMOTHY, 1745–1829. Colonel in Revolutionary War; Adjutant-gen. 1777; Quartermaster-gen. 1780–85; U. S. Postmaster-gen. 1791–95; Sec. of War Jan. 1795, and main founder of the Military Academy; Sec. of State 1795–1800; U. S. Senator from Mass. 1803–11, and conspicuous as a Federalist; M.C. 1813–17; active through life in public affairs.—His son, JOHN, LL.D., 1777–1846, City Solicitor of Boston from 1829, was noted as a philologist. *Greek Lexicon*, 1826; *Indian Languages*, 1836.—His nephew, CHARLES, M.D., 1805–1878, was naturalist to the Wilkes Exploring Expedition 1838–42. *Races of Man*, 1848; *Animals and Man*, 1854; *Distribution of Plants*, 1861.

Picketing. Custom of employés, during a strike, of posting certain of their number at the approach to their places of usual employment, to explain to other workmen the circumstances of the case, and try to dissuade them from going to work there.

Pickett, ALBERT JAMES, 1810–1858. Historian of Alabama 1851.

Pickett, GEORGE EDWARD, 1825–1875. Major-gen. C.S.A. 1862; famous for his charge at Gettysburg July 3, 1863.

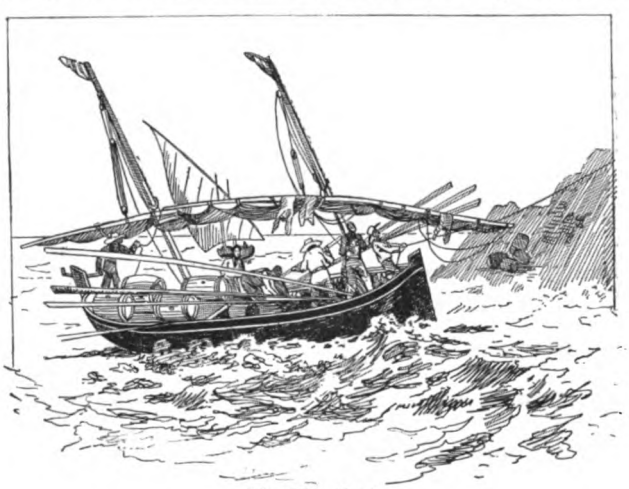
Picking the Plums. Game in which a number of marbles are placed in a line nearly touching each other, and the players shoot at these, each taking those knocked off the line.

Pickles. Vegetable or animal food preserved with vinegar, sometimes with salt or spices.

Pickling. See PRESERVATION OF FOOD.

Picknell, WILLIAM LAMB, b. 1854. American landscape painter.

Pico. One of the Azores Is., belonging to the central group. It is covered with lava; has a volcanic peak 7,613 ft.



Pico Wine-Boat.

high. The island is well timbered, very fertile, and produces wine in large quantities. Chief towns are Magdalena and Lagos. Area 254 sq. m. Pop. 29,000.

Pico della Mirandola, GIOVANNI, COUNT, 1463–1494. Italian scholar and philosopher, once esteemed a marvel of genius and learning. His proposed discussion of 900 theses at Rome, 1486, was forbidden by the Pope. His Latin writings were collected 1496, and often reprinted.

Picoline. $C_5H_4N.CH_3$. Methylpyridine: known in three forms, all of which are liquids of strong odor contained in bone-oil. They are strong bases.

Picot, FRANÇOIS ÉDOUARD, 1786–1868. French painter.

Picquet, FRANÇOIS, 1708–1781. French missionary in Canada 1735–59; active against the English, who outlawed him; writer on Canadian history.

Picrates. Salts of picric acid. Potassium picrate is a violent explosive; when mixed with niter and charcoal and grained it forms Designolle's powder, which has been used for torpedoes and for both cannon and small arms. Ammonium picrate is less sensitive and burns without explosion in air; mixed with nearly equal parts of niter it forms Brugere's powder, which has about twice the strength of ordinary gun-

powder, but is too violent for small arms. Picrates form the bases for certain of the SMOKELESS POWDERS (q.v.).

Picric Acid. C_6H_2: $(NO_2)_3$.OH. Trinitrophenol. Mpt. 122.5°C. Lemon-yellow crystals, soluble in water; prepared by the action of nitric acid upon phenol and many organic compounds, silk, leather, wool, resins, etc.; used as a yellow dyestuff on wool and silk. It forms salts, as $C_6H_2(NO_2)_3OK$, potassium picrate. These salts are very dangerous and powerful explosives, and are prepared by neutralizing the acid with an alkali. The acid forms well crystallized addition products with many hydrocarbons.

Picrotoxin. $C_{30}H_{34}O_{13}$. Very poisonous and very bitter, colorless needles, obtained from *Cocculus indicus*, the berry-like fruit of *Anamirta paniculata*, a shrub of the E. Indies. It acts much like strychnine.

Pictet, FRANÇOIS JULES, 1809–1872. Prof. Geneva; Swiss zoölogist who devoted nearly thirty years to the fossils of the Jurassic and Cretaceous deposits of Switzerland. *Traité de Paléontologie*, 4 vols., 1844–46.—Of his relatives, ADOLPHE, 1799–1875, prof. Geneva 1836, wrote on the Aryans and Celts; MARCUS AUGUSTE, 1752–1825, and RAOUL b. 1842, prof. Geneva, were noted physicists and chemists; the latter, 1877, announced the liquefaction of hydrogen, nitrogen and oxygen, pub. memoir 1878.

Picton, SIR THOMAS, 1758–1815. English general, distinguished in Spain 1810–11; killed in leading a charge at Waterloo.

Picts. Early Celtic inhabitants of s. and e. Scotland; united with the Scots under MacAlpin 844.

Picture Gallery. Room for the exhibition of pictures. The various galleries are described under their respective names.

Picture Writing. See HIEROGLYPHICS.

Pidgin-English. Dialect manufactured to assist the intercommunication of Europeans and Chinese; mostly English, corrupted to meet Chinese capacities, as by adding *ee* to words, substituting *belong* for *be*, *my* for *I*, and the like. Also written Pigeon-English.

Piece, FIELD. In U.S. Service there are two guns, the 3.2 in. and the 3.6 in. calibers, the former for the light and horse batteries and the latter for the heavy field battery; both are breech-loading steel rifled guns. The 3.2 in. fires a 13.5 lb. projectile, is 7.31 ft. long, weighs 794 lbs., has muzzle velocity 1,685 f. s., and maximum range for shrapnel 6,613 yds. The 3 6 in. fires a 20 lb. projectile, is 7.79 ft. long, weighs 1,181 lbs., has muzzle velocity 1,550 f. s., and maximum range 7,420 yds. See FIELD ARTILLERY, FIELD BATTERY and FIELD CARRIAGE.

Piece-work Wages. Wages paid according to the amount of work performed, instead of according to the length of time the employé is on duty.

Piedmont. Region of n.w. Italy; held by House of Savoy from ab.1190. Area 11,340 sq. m.

Piedmont (MT. CRAWFORD). Near Staunton, Va.; scene of a Union victory June 5, 1864.

Pied Piper. Mediæval European myth, made familiar by Browning's poem. Hameln in Saxony was infested with rats, which were charmed away 1284 by a man attired in a party-colored suit. The townsmen agreed to give him a sum of money to rid the place of the vermin, whereupon he piped, and the rats all followed him to the Weser and there perished. When the authorities refused to pay, the piper, again piping, drew all the town children with him to the mountain, which opened and they disappeared therein.

Pie-Powder Court. Formerly held at fairs in England.

Pier. Masonry column supporting a bridge; when built near shore and supporting only one end of a span, it is called an ABUTMENT (q.v.). The deepest piers in the U. S. are those of the bridge over the Hudson at Poughkeepsie; they were sunk by dredging through cribs to a depth of 130 ft. below the water surface. The deepest pier foundation is that of the Hawksbury bridge in Australia, 170 ft. below water level.—Piece of wall between two openings, or an isolated mass of masonry.

Pierce, BENJAMIN, 1809–1880. Prof. Harvard from 1833; superintendent U. S. Coast Survey 1867–74; author of text-books on Algebra, Geometry, and Trigonometry. *Analytical Mechanics*, 1857; *Linear Associative Algebra*, 1870.

Pierce, FRANKLIN, 1804–1869. Fourteenth president of the U. S.; M.C. from N. H. 1833–37; U. S. Senator 1837–42; Pres. 1853–57. His administration was pledged to the enforcement of the Fugitive slave law. The repeal of the Missouri Compromise and the Kansas-Nebraska troubles hastened the formation of the Republican party and the beginning of the Civil

Franklin Pierce.

War. The treaty with Japan, the OSTEND MANIFESTO (q.v.), and the settlement of Mexican boundary dispute occurred in his term.

Pierian. Belonging to the Muses, whose birthland was Pieria in Macedonia, at foot of Mt. Olympus.

Pierola, NICOLAS DE, 1798–1857. Peruvian scientist; director National Museum at Lima from 1845; Sec. Treasury 1852–54.—His son, NICOLAS, b. 1839, was dictator, or Supreme Chief, of Peru 1879–81, during the war with Chili; exiled 1885; Pres. 1895.

Pierpont, JOHN, 1785–1866. American poet and reformer.

Pierre Perdue. Riprap, or random stone, thrown around the base of a pier to protect it from the current; also used in breakwaters.

Pierrepont, EDWARDS, LL.D., D.C.L., 1817–1892. Judge New York City Superior Court 1857–60; U. S. Attorney-gen. 1875–76; Minister to London 1876–78.

Piers Plowman. See LANGLAND, WILLIAM.

Pietà. Representations in Italian sculpture or painting of the Madonna holding the dead Saviour in her arms. The finest

Pietà, bas-relief at Nuremburg, by Adam Krafft.

statuary representation of this subject is that by Michelangelo in St. Peter's. One of the finest paintings of this subject is that by Giovanni Belleni at Milan.

Pietermaritzburg. Capital of Natal, S. Africa. Pop., 1891, 17,500.

Pietism. Movement begun at Frankfort 1670 by P. J. Spener, and carried on at Leipzig, and later at Halle, by A. H. Francke and other earnest men, who laid more stress on religion of the heart and life than on ecclesiastical or doctrinal distinctions; they were Lutherans, and founded no sect. Their influence, great for a time, was opposed by the rationalism of the 18th century.

Pietra Dura. Florentine mosaic work in which jasper, agate, and other hard stones are inlaid in a slab of marble.

Piezometer. Apparatus devised by Oersted, and used for measuring the compressibility of liquids. It consists of a strong glass cylindrical vessel, fitted at its top with a metallic cylinder of smaller diameter, in which is a tightly fitting piston movable from without by a screw. The vessel containing the liquid to be compressed is a cylindrical bulb terminating in a capillary tube dipping under the surface of the mercury. This is placed within the instrument and the latter filled up to the movable piston with water. If the screw be turned down, the pressure applied will be transmitted by means of the mercury to the liquid contained in the inner vessel. The capillary tube is graduated so that, by noting the movement of the mercury surface as it rises in it, the compression of the liquid under examination can be calculated. There is also contained a closed air manometer, which indicates the pressure applied. See GAUGE, STEAM.

Piezometric Level. Difference of level of two atmospheric layers as expressed not by elevation (orometric), or by temperature (thermometric), or by density (pyknometric), but by barometric pressure (piezometric); so called by Lasne 1888.

Pig. See SUIDÆ and SWINE.

Pigafetta, FRANCESCO ANTONIO, 1491–1535. Italian who sailed with Magellan 1518–22, and kept a journal of the memorable voyage. *Viaggio intorno al Globo Terracqueo*, 1800.

Pigeon-Berry. See POKEWEED.

Pigeons. 300 species included in 4 families of the order COLUMBÆ (q.v.). Their distribution is world-wide, but they are absent from localities inhabited by monkeys. In Oceanica and s.e. Asia is the genus *Ptilopus*, containing 80 species that vie with Paradise birds in coloration. In N. America is *Ectopistes*, the wild or Passenger Pigeon, once present in incalculable numbers; it could fly 100 m. per hour. In Jamaica is a species resembling quails, and in Australia is a species that attains a lb. wt. (see DODO). *Columba livia*, the Rock Dove of the

Rock Dove (*Columba livia*).

Mediterranean region, is the ancestor of our domestic breeds, such as Fantails, Tumblers, Pouters. Doves differ from Pigeons in having smaller heads, more graduated tails and subdued colors. Pigeons have the nostrils situated in a cere; their wings are long and pointed, and tail long and rounded, containing 12 to 20 rectrices. They can drink without raising the head. They are monogamous; both sexes care for the young, which never exceed two, and are born naked and blind. These receive food moistened by a special milky secretion in the crop. See CARRIER PIGEONS.

Pigeons, HOMING. Highest speed record of U. S. in homing pigeons 200 m., speed 1,875 yds. per minute, in 1893; the longest distance is 1,183 m. in 13½ days, in 1892; the best record is 614 m., speed 1,349 yds. per minute, in 1896.

Pigeon-Shooting. In U. S. shooting with shot-guns at birds from traps is at a distance of 30 yds. One hundred consecutive birds have been shot by Bogardus 1869 and by Bandle 1888. One hundred and eighty-eight out of 200 were shot by Murphy 1896, five traps being used. Five hundred glass balls out of 514 were broken 1881 by Haskel in 24 min. 2 sec. One hundred out of 105 clay pigeons were broken by Heikes 1896 in 3 min. 7 sec.

Pigeon Weed. *Lithospermum arvense.* A troublesome biennial weed, especially in wheat. In land once infested, the only remedies are hand-pulling and a thorough bare summer fallow.

Piglhein, BRUNO, 1848–1894. German artist. Prof. Munich; chiefly noted for religious subjects.

Pigment. Powdered substance, either animal or vegetable, used as a color. The oldest are those of the paintings of the Egyptians, who confined themselves to red, yellow, green, blue, black, and white. The Greeks owed their knowledge of painting, practiced by them ab.450 B.C., to the Egyptians. See PAINTS.

Pigmy. See PYGMY.

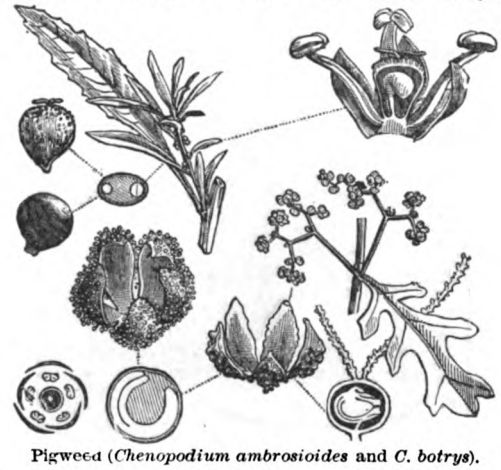
Pignotti, LORENZO, 1739–1812. Italian poet and historian.

Pignut. *Hicoria glabra.* Large forest tree of the Walnut family, native of the e. U. S., known as Broom Hickory.

Pigres, 5th cent. B.C. Greek satiric poet, supposed author of *Margites* and *Battle of Frogs and Mice.*

Pigs in Clover. Mechanical puzzle, consisting of a small circular box containing several ring-shaped communicating partitions, one within the other, in which are small free-rolling balls. The object of the puzzle is to bring the balls together in a middle place called the Pen. It was invented 1889 by M. Lyman of Waverly, N. Y. It at once became a popular craze; hundreds of modifications of it appeared, and it was carried to all parts of the world. It is one of the few modern inventions of its kind, if not the only one.

Pigweed. The various species (*Amarantus* and *Chenopodium*, called Goosefoot) are ordinarily more unsightly than otherwise troublesome, and may be kept in check by cutting.



Pigweed (*Chenopodium ambrosioides* and *C. botrys*).

Sometimes they are troublesome in cultivated crops in very rich land, and then are kept in check only by early and frequent stirring of the soil with hoe and cultivator.

Pike. See PERCH and HAPLOMI.

Pike. Spear of varying length, in general use from ancient times till ab.1530; since ab.1700 employed only for irregular warfare. The bayonet now replaces it. See BAYONET.

Pike, ALBERT, 1809–1891. American poet; Brig.-gen. C.S.A. 1862. *Hymns to the Gods*, 1839–54.

Pike, WARBURTON, b. 1859. Canadian explorer. *Barren Ground*, 1892; *Subarctic Forest*, 1896.

Pike, ZEBULON MONTGOMERY, U.S.A., 1779–1813. Explorer of the upper Mississippi 1806–7; discoverer of Pike's Peak, Col., 1806; killed in attacking York (Toronto), Canada.

Pike's Peak. Summit of the Colorado range, Col. Altitude 14,147 ft. Here the U. S. Signal Service maintained a meteorological station 1842–88.

Pilacreæ. Family of *Fungi* of the sub-class *Basidiomycetes*, occurring on the Hornbeam and Beech.

Pilaster. Flat and shallow pillar placed against a wall, and corresponding in treatment to the circular and free-standing columns used in the same edifice.

Pilate, PONTIUS. Roman procurator of Judæa 26–36. He permitted the execution of Jesus, was accused of extortion and cruelty by Samaritans, and is said to have been banished to Gaul.

Pilatus, MOUNT. In Switzerland, w. of Lake Lucerne. Altitude of its highest peak 7,000 ft. A railway, built 1889, reaches the summit. An old tradition places Pilate's body in a pond near the top.

Pilau. Oriental dish of rice and onions, sometimes with meat or fowls.

Pilcomayo. Branch of the Paraguay. It flows s.e. across Bolivia from the Andes, and forms part of the n.e. boundary of Argentina. Its upper course is unexplored. Length 1,000 m. or more.

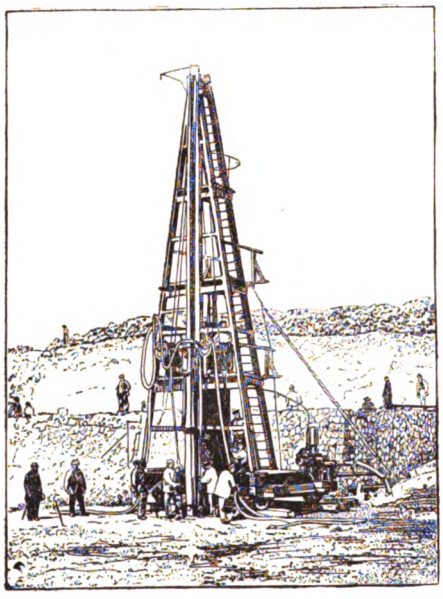
Pile. Column of timber or iron sunk in the earth. Wooden piles are generally round, 9 to 18 in. in diameter at top and ab. 6 in. at base; the base is often provided with an iron shoe. Creosoting is used as a protection against sea-worms. Piles should be driven in soft soil until they sink less than 1 in. under a blow of a ram equal in weight to that of the pile. Sheet piles are those driven in close contact to form a wall or inclosure; they are fastened together by iron clamps. See DISK PILE, SCREW PILE.

Pileate. Organs having or resembling a pileus.

Pileated Woodpecker. See WOODPECKER.

Pile Bridges. Formed of trestle bents with spans rarely greater than 30 ft. Cæsar's bridge over the Rhine was a trestle structure.

Pile Driver. Apparatus for driving piles, consisting of a ram with the arrangements for raising it and guiding it. The common driver has a ram weighing 1,500 lbs., which falls from



Pile Driving—Process of sinking the piles by water jets.

10 to 20 ft. and makes 5 blows per minute. The steam driver has a ram weighing from 2,000 to 4,000 lbs., which falls only 3 ft. but makes 50 blows per minute. Gunpowder and dynamite have been used to drive piles. See NASMYTH PILE DRIVER.

Pileolus. Diminutive of pileus.

Pileorhiza. In Botany, root-cap.

Piles. See HÆMORRHOIDS.

Pileus. Cap or spreading portion of mushrooms, toadstools, and other hymenomycetous *Fungi.*

Pilewort. *Ficaria ficaria.* Low, yellow-flowered herb of the Buttercup family, native of Europe, sparingly introduced into the U. S.

Pilgrim. See PALMER.

Pilgrimage of Grace. Uprising of the rural population in Lincolnshire and Yorkshire, Eng., in 1536 in opposition to the suppression of minor monasteries; there were about 60,000 rebels, who were quickly dispersed, about 20 being executed in 1537.

Pilgrimages. Journeys to sacred places; often undertaken from ab. 325; imposed as a religious discipline in the Middle Ages, and regarded as good works; common among Mohammedans and Hindus.

Pilgrim Fathers. English separatists, who in 1620 founded Plymouth Colony; to be distinguished from the non-separatist PURITANS (q.v.) who in 1628 founded and in 1630 settled Massachusetts Bay.

Pilidium. Larva of certain nemertine worms. It is helmet-shaped. As with the Echinoderm larvæ, the adult is produced through histolytic metamorphosis.

Piliferous Layer. Epidermal portions of young rootlets, bearing an abundance of root-hairs.

Pillar. Vertical shaft or column bearing a load. Its strength varies inversely with the square of its length, when the size is small compared to length.

Pillar. Block of coal, ore, or rock, left standing to support the roof of a mine. Pillars vary in size from a few feet to several yards in width, according to the nature of the ground to be supported.

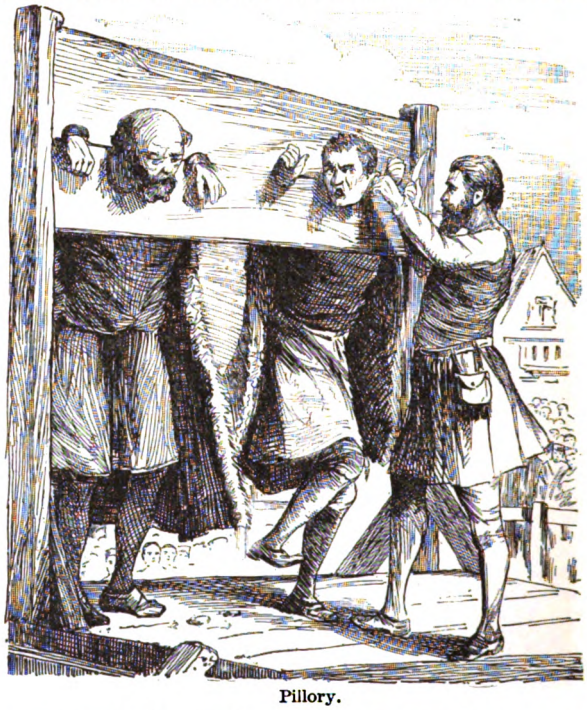
Pillar and Stall. Method of coal-mining, in which the working places and excavated portions are long and narrow, usually parallel to each other, and separated by pillars of standing coal.

Pillar-Saints. See STYLITES.

Pillars of Hercules. Heights on either side the Straits of Gibraltar; supposed to have been reared by Hercules as memorials of his making an outlet for the Mediterranean.

Pilling, JAMES CONSTANTINE, b. 1846. Connected with U. S. surveys 1872–79, and since with Smithsonian Bureau of Ethnology; author of bibliographies of sundry Indian languages.

Pillory. Instrument used from remote to recent times, whereby a prisoner's neck and wrists were fastened in holes in



Pillory.

a board, causing his head and hands to protrude shamefully; abolished in England 1837; used in some Southern States later.

Pillow, FORT. In Tenn.; captured by Union forces June 4, 1862; by Confederates April 13, 1864, when nearly the whole (colored) garrison was killed.

Pillow, GIDEON JOHNSON, 1806–1878. Brig.-gen. Tenn. Vols. 1846; Major-gen. U.S.A. 1847–48, serving throughout the war with Mexico; Brig.-gen. C.S.A. 1861; second in command at Fort Donelson Feb. 1862, whence he escaped.

Pills. Medical preparation formed by mixing the ingredients usually with an excipient to make them cohesive, and then fashioning into spheroidal bodies of the prescribed size. They are frequently covered with a coating, as sugar or gelatin, to prevent tasting the medicine.

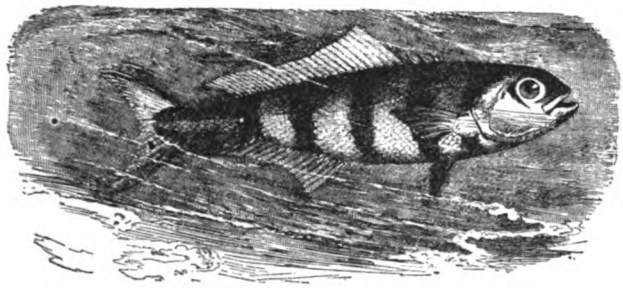
Pilon, GERMAIN, d. 1590. French sculptor, ranking next to Goujon. His groups of the *Three Graces* and *Four Cardinal Virtues* in the Louvre are important works, designed as tomb monuments and as supports for cinerary urns.

Pilose. In Botany, organs provided with soft, long, scattered hairs.

Pilot. Person legally authorized to conduct a ship through a specified locality. His appointment, fees, rights, and powers are generally regulated by statutes. In U.S. pilots are licensed under U. S. laws, by a commission or by a State Governor; in Great Britain the Pilotage Authorities have charge of this subject.

Pilot Fish (NAUCRATES DUCTOR). Acanthopterygian fish of the family *Carangidæ.* It lives in the high seas, attains a

length of ab. a foot, and is marked by several broad black bars. It has four short spines in front of the dorsal fin. It is sup-



Pilot Fish (*Naucrates ductor*).

posed to guide sharks to their food, because found associated with them, but this remains unexplained.

Pilot Knob. In Mo. Here a Union force of 1,200 repulsed two assaults of Gen. Price with 10,000 men, Sept. 26, 1864, inflicting a loss of 1,000, but retreated by night.

Piloty, KARL VON, 1826–1886. German painter, prof. Munich Academy 1856, director 1874. He exercised an important influence as a teacher, on American artists among others. He represents some advance in color beyond most of his German contemporaries, although far below Makart.

Pilpay, or BIDPAI. Reputed author of a noted collection of Indian fables, tr. from the Sanskrit into Pehlevi, or early Persian, in the 6th century, and subsequently into Arabic, Greek, Latin and most European languages. *Kalilahand Dimna*, the Arabic version, 750, is the earliest extant. The PANCHATANTRA, the MAHA-BHARATA, and the HITOPADESA (q.v.), each contain portions of this work.

Pils, ISIDORE ALEXANDRE AUGUSTE, 1815–1875. French painter, especially of battle-scenes.

Pilsen. City of w. Bohemia, on the Beraun. It has manufactures of woolens, cottons, etc. Taken by Ziska 1421; occupied by Wallenstein 1633–34; now noted for its beer, annual product 300,000 bbls. Pop. 1891, 50,693.

Pim, BEDFORD CLAPPATON TREVELYAN, R. N., 1826–1886. Arctic explorer, M.P. 1874–80. *Gate of the Pacific*, 1863.

Pimaric Acid. $C_{20}H_{30}O_2$. Mpt. 148° C. Main constituent of galipot resin. See ABIETIC ACID, which it closely resembles.

Pimentel, MANOEL, 1650–1719. Portuguese geographer, dealing with S. America.

Pimento (ALLSPICE). West Indian spice, from the fruit of *Eugenia pimenta*, a tree found mostly in Jamaica.

Pimpernel. *Anagallis arvensis.* Low, weedy herb of the Primrose family, with variously colored flowers, usually scarlet, which close in cloudy weather, whence it is known as Poor Man's Weather-glass. It is native of Europe and introduced into N. America.

Pimpernel (*Anagallis arvensis*).

Pimpernel, FALSE. *Lysanthes gratioloides.* Small marsh plant of the natural family *Scrophulariaceæ*, native of N. America.

Pimpernel, WATER. See BROOKWEED.

Pimples. Name commonly given to small swellings of the skin. These may contain a small quantity of pus (pustules) or be solid throughout (papules).

Pina Cloth. See PINEAPPLE.

Pinacothek. Picture gallery of Munich, completed 1836 by Klenze. The paintings are of rare value and include the famous Boisserée collection of old German masters.

Pinchbeck. Alloy consisting of two parts of copper and one of brass.

Pinckney, CHARLES, LL.D., 1758–1824. Member of the U.S. Constitutional Convention of 1787; Gov. of S. C. 1789–93, 1796–98 and 1806–8; U. S. Senator 1798–1801; Minister to Spain 1802–5; M.C. 1819–21; anti-federalist.—His son, HENRY LAURENS, 1794–1863, M.C. 1833–37, founded the Charleston *Mercury* 1819, and edited it till 1834.—Their cousin, CHARLES COTESWORTH, 1746–1825, was a colonel in the Revolutionary War, member U.S. Constitutional Convention 1787, major-gen. U.S.A. 1797, and a leading Federalist.—His brother, THOMAS, 1750–1828, was Gov. of S. C. 1787–89; Minister to England 1792–94, and to Spain 1794–96, where he secured the free navigation of the Mississippi; M. C. 1799–1801; major-gen. U.S.A. 1812, acting against the Creeks.

Pindar, ab. 522–ab. 442 B.C. Most famous Greek lyric poet, who spent the greater part of his life at Thebes, but was for a time at the court of King Hiero of Syracuse. He composed odes for many princes and others. We possess his *Epinicia* or triumphal odes, in four books, in honor of victors in the Olympian, Pythian, Nemean and Isthmian games. He was a versatile writer of deep religious and patriotic feeling, joined to poetic talent of the highest order.

Pindar.

Pindar, PETER. See WOLCOT, JOHN.

Pindarees. Roving guerrillas and robbers in India, overthrown 1817 by Warren Hastings.

Pindemonte, IPPOLITO, 1753–1828. Italian poet and essayist. *Poesie Campestri*, 1785; *Sermoni*, 1805; tr. *Odyssey*, 1809–22; *Epistole*, 1819; *Elogi*, 1825.

Pindus. Mountain range between Thessaly and Epirus.

Pine. Trees of the family *Coniferæ*, genus *Pinus*, yielding important timber. There are numerous species, widely distributed throughout the n. temperate zone. Scotch Pine, *P. sylvestris*, called Scotch Fir, is the only species indigenous to Great Britain. Black Pine, *P. nigricans*, is a native of Austria. Taurian Pine, *P. maratima*, Aleppo Pine, *P. halepensis*, and Corsican Pine, *P. laricis*, are found in s. Europe. Other European species are Cluster Pine, *P. pinaster*, Pyrenean Pine, *P. pyrenaica*, and Stone Pine, *P. bruttia*. In N. America are Red Canadian Pine, *P. resinosa*, Scrub Pine, *P. banksiana*, Yellow Pine, *P. rariabilis*, Jersey Pine, *P. niops*, Pitch Pine, *P. rigida*, Southern Pine, *P. palustris*, White Pine, *P. strobus*, and *P. lambertiana*. Most of these trees furnish valuable timber, though the term Pine-timber is applied to wood of species of other genera. Many of these trees yield turpentine as sap, from which rosin and oil of turpentine is obtained.

Pine, ROBERT EDGE, 1730–1788. English portrait painter, in Phila. from 1783.

Pine, STRENGTH OF. The tensile strength is about 10,000, and the compressive strength from 5,000 to 8,000 lbs. per sq. in. of cross-section.

Pineal Eye. Rudimentary eye, present in the top of the cranium of certain Reptiles, and represented rudimentarily in Mammals by the pineal gland.

Pineapple. *Ananassa sativa.* Herb of the natural family *Bromeliaceæ*, native of S. America; widely cultivated in tropical countries and in hothouses in Europe for its delicious

Pineapple (*Ananassa sativa*).

fruit. It weighs from 2½ lbs. to 12 lbs. Pina muslin is made from the fibers of the leaves of this and allied species. Pineapple rum is flavored with pineapple.

Pineapple Essence. See BUTYRIC ETHER.

Pine-Drops. *Pterospora andromedea.* Large herb of

the natural family *Monotropaceæ*, parasitic on the roots of trees, native of the n. U. S. and Canada.

Pinel, JACQUES, 1640–1693. French buccaneer in W. Indies, made a marquis by Louis XIV. after abducting and marrying an heiress of rank; founder of a wealthy family.

Pinel, PHILIPPE, 1745–1826. French alienist, reformer of the treatment of the insane, and first to study properly and understand their condition.

Pinelo, ANTONIO DE LEON, ab.1590–ab.1675. Officer of the COUNCIL OF THE INDIES (q.v.). He wrote much on the Spanish colonies, and codified their laws.

Pinene. $C_{10}H_{16}$. Two varieties, dextro and lævo. Bpt. 158°–161° C. Principal constituent of American and German oil of turpentine, oil of juniper, etc. See TURPENTINE, OIL OF.

Pinene Hydrochloride. $C_{10}H_{17}Cl$. Terpene hydrochloride; solid white crystalline, insoluble substance, resembling camphor in odor and appearance. Treated with an alkali it yields camphene. It is known as "artificial camphor," and is made by passing hydrochloric acid gas into oil of turpentine.

Pinero, ARTHUR WING, b. 1855. English playwright. *The Squire*, 1881; *Mrs. Ebbsmith*, 1895.

Pinerolo. Town of n.w. Italy, 23 m. s.w. of Turin, with a citadel long alternately held by Savoy and France. Pop. ab. 12,000.

Pine-Sap. *Hypopitys hypopitys.* Saprophytic plant of the natural family *Monotropaceæ*, native of the n. hemisphere; also called False Beech-drops.

Pine-Sap (*Hypopitys hypopitys*).

Pine-Sap, SWEET. *Schweinitzia odorata.* Parasitic herb of the natural family *Monotropaceæ*, growing on the roots of herbs in the s.e. U. S.

Pines, ISLE OF, or HUNCA. In the southern Pacific, belonging to France, 30 m. s.e. of New Caledonia; discovered by Cook 1774, and since 1872 a penal colony. Turtles are abundant. Area 72 sq. m. Pop., exclusive of convicts, ab. 800.

Pines, ISLE OF. Cuban dependency, 37 m. s. of Cuba. It has quarries of marble, and is a favorite resort for invalids having lung diseases. Area 1,214 sq. m., pop. ab. 2,500.

Pine Tree Money. The first mint established in Boston issued in 1652 coins of the value of 3, 6, and 12 pence, with a pine tree on the obverse.

Pine-Weed. See ORANGE-GRASS.

Pine Wool. Fiber obtained from the leaf-needles of the Scotch fir and woven into blankets for hospital use. It is usually mixed with cotton or wool, and supposed to have medicinal properties.

Pingré, ALEXANDRE GUI, 1711–1796. French astronomer. *Cométographie*, 1783.

Ping-Yang. In e. China; scene of a Japanese victory Oct. 28, 1894.

Pinheiro, SYLVESTRE FERREIRA, 1769–1847. Portuguese publicist and Minister of State.

Pini, GAETANA, 1846–1886. Italian physician and philanthropist.

Pinillos, CLAUDIO, COUNT OF VILLANUEVA, 1782–1853. Supt. 1825–50 of Cuban finances, which he greatly improved.

Pink. Showy-flowered herbs of the genera *Dianthus* and *Silene*, natural family *Caryophyllaceæ*, natives of the n. hemisphere; much cultivated in gardens.

Pink, FIRE. *Silene virginica.* Crimson pink of s.e. U. S.

Pink, MOSS. *Phlox subulata.* Low, tufted, purple-flowered plant of the natural family *Polemoniaceæ*, native of the s.e. U. S.; known as Ground Pink.

Pinkerton, ALLAN G., 1819–1884. Founder of a detective agency in Chicago 1850; head of U. S. Secret Service 1861–65. *Molly Maguires*, 1877; *Thirty Years*, 1884.

Pinkerton, JOHN, 1758–1826. Scottish writer, chiefly of history. *Voyages and Travels*, 17 vols., 1808–14; *Correspondence*, 1830.

Pinkeye. Contagious inflammation in the eyes of horses in which the white of the eye appears as deeply congested. The disease may occur in man, and the word is popularly used to indicate any disease of the eye where the conjunctiva is reddened. Washing the eye with antiseptic lotions, as of boric acid or of borax, is curative in mild cases.

Pinkie Clough. Battle near Edinburgh, Sept. 10, 1547; the English under Somerset totally defeated the Scots under Arran, who lost 10,000 men besides 1,500 prisoners; English loss ab. 200.

Pinkney, WILLIAM, 1764–1822. U. S. Commissioner to England 1796–1804 and 1806; Attorney-gen. of Md. 1805; Minister to England 1807–11, and to Russia 1816–18; U. S. Attorney-gen. 1811–14; M.C. 1815–16; U. S. Senator 1820.—His son, EDWARD COATE, 1802–1828, wrote some memorable verses; his nephew and biographer, WILLIAM, D.D., LL.D., 1810–1883, became assistant Bp. of Md. 1870 and Bp. 1879.

Pink-Root. *Spigelia marylandica.* Showy-flowered officinal herb of the natural family *Loganiaceæ*, native of the s. e. U. S.

Pink Salt. Ammonium chlorstannate. $SnCl_4.2NH_4Cl$. Mordant for cotton prints.

Pin-Money. Sum allowed by the husband to the wife for her dress, decoration and ornament. Pins were acceptable New Year's gifts to ladies, in place of the wooden skewers which they used until ab. 1500. They sometimes received a composition in money whence the term.

Pinna. Leaflet of a compound leaf, especially in ferns.

Pinnacle. In Gothic Architecture, a tapering mass of stone crowning a buttress, and having for its mechanical function to add to its height, but often elaborately enriched by carving.

Pinnacocytes. Pavement-like epithelial cells, such as constitute the ectoderm in Sponges and also line the paragastric cavity and canals in all but the lowest sponges.

Pinnate. Arrangement of the veins of a simple leaf, or the leaflets of a compound leaf, laterally along a central midvein or axis, like the disposition of the barbs on the shaft of a feather.

Pinnatifid. Leaves which are divided nearly to the midrib into lateral segments.

Pinney, NORMAN, 1800–1862. American author of French text-books.

Pinnigrada. See PINNIPEDIA.

Pinnipedia (PINNIGRADA). Sub-order of *Carnivora*, comprising the Seals and Walruses. The limbs are short, the hinder ones directed backward, and the toes united by skin to form swimming paddles. The tail is short and conical. The skin rests upon a layer of fat (blubber), and bears a short dense fur, usually interspersed with bristles. The ears are small or absent. The lungs are large, the intestine very long compared with that of other *Carnivora*. The food is fish, shellfish, and other marine animals. There are three families: PHOCIDÆ, OTARIADÆ, and TRICHECHIDÆ (q.v.).

Pinnock, WILLIAM, 1781–1843. English author of historical and other text-books, some of them widely used.

Pinnulæ. Simple jointed side twigs on the branched arms of Crinoids (Stone Lilies).

Pinnule. Division of a pinna or leaflet in a decompound leaf, especially in ferns.

Pinnulus. Pentactine sponge spicule, having spines on one ray; present in the genus *Asconema*.

Pinocle. German Bezique, played with two packs of cards, Ace to Nine, the game being 1,000 points, and it may be played by from two to four persons. In two-handed game 24 cards are dealt, the next card being trump, and the balance are drawn with the play. The cards are then played, but one is not required to follow suit. Combinations are declared as in Bezique. After the pack is exhausted, the cards not played are taken in hand and played, following suit and taking the trick if possible, and trumping when the player has not the suit. In three-handed game the whole pack is dealt and the cards are played as in two-handed game after the pack is exhausted. The four-handed game is played as in the three-handed game, but may be played as partners. Pinocle is combination of queen of spades and knave of diamonds.

Pins. The earliest pins were probably fish bones or thorns. Pins with gold heads have been found in Egypt and bronze pins at Pompeii. Brass pins were brought from France 1540, and first made in England 1543. Solid headed pins were first made by machinery in England 1824 under patents of L. W. Wright, an American. Pins are now made entirely by machinery, even to sticking them in papers, which was patented by T. Fowler in 1860. Ordinary pins are brass, coated with tin in

a water solution of argol. Black pins are iron, coated with varnish or blued in a muffle.

Pinsuti, CIRO, 1829–1888. Italian composer, mostly of songs.

Pint. Eighth of a gallon; U. S. 28⅞ cu. in., imperial 34.66 cu. in.

Pinto, FERNAM MENDEZ, ab. 1510–ab. 1583. Portuguese trader, in Asia 1537–58. *Travels*, 1614, tr. 1663.

Pinto, FRANCISCO ANTONIO, ab.1785–1858. Pres. of Chili 1827–29.—His son, ANIBAL, 1824–1884, was Pres. 1876–81.

Pinturicchio (DI BETTI), BERNARDINO, 1454–1513. Italian painter, represented by important frescoes in the Siena Cathe-

The Annunciation, at Spello, Italy, by Pinturicchio.

dral. His affinities with Perugino are marked, but his originality was greater. He had influence on Raphael, who worked under him in youth.

Pinweed. Low woody plants of the genus *Lechea*, natural family *Cistaceæ*, natives of e. N. America.

Pin Worms. Animal parasites (*Ascaris vermicularis*) whose habitat is in the large intestine. They are from 4 to 12 in. long, resembling a short piece of cotton thread, whence another name, Thread worms. The chief symptom of their presence is an intense itching at the anus. The most successful treatment applies the vermifuges locally by enema or suppository. From their habitat, they are sometimes called Seat worms. See ASCARIDÆ.

Pinxter-Flower. *Azalea nudiflora.* Showy-flowered shrub of the Heath family, native of e. N. America; known also as Wild Azalea.

Pinzon, MARTIN ALONSO, 1441–1493. Associate and rival of Columbus; captain of the *Pinta* 1492.—His brother, VICENTE YAÑEZ, ab.1460–ab.1524, had command of the *Nina* 1492, and discovered Brazil 1500; another, FRANCISCO MARTIN, ab.1462–1500, was pilot of the *Pinta*.—Their nephew, ARIAS MARTIN, 1465–1510, was pilot of the *Nina*, sailed with Columbus twice later, and with Vicente 1499, 1507, and 1509.

Piombino. Italian principality, including part of Elba; connected with Lucca 1806–14; assigned to Tuscany 1815. Area 139 sq. m.

Piombo, SEBASTIAN DEL, 1485–1547. Italian painter, great colorist, and associate of Michelangelo, who made the design for his *Resurrection of Lazarus* in the National Gallery. His works are rare, and of the first rank. Several of them have been ascribed to Raphael; *e.g.*, the *Fornarina* of the Uffizi in Florence.

Pioneers. Military road and bridge builders, who remove obstruction from the path of an army.—In civil life, first settlers of a new country, who clear and plant the land.—Figuratively, advance guards of civilization, in science, art, or any department of thought or activity.

Piorry, PIERRE ADOLPHE, 1794–1879. Prof. Paris 1840–66; inventor of the pleximeter; writer on pathology.

Piozzi, HESTER LYNCH (SALUSBURY), 1741–1821. Friend (as Mrs. Thrale, 1763–81) of Dr. Johnson; wife of G. Piozzi, 1784–1809. *Anecdotes of Dr. S. Johnson*, 1786; *Letters*, 1788; *Autobiography*, 1861.

Pip. Name formerly given to different diseases of fowls. See ROUP.

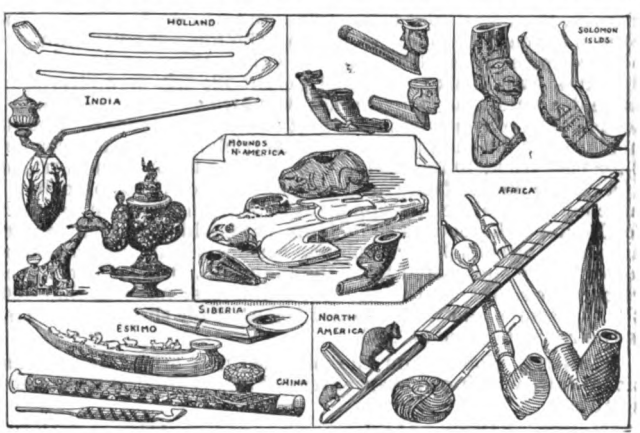
Pipe. Wrought-iron tube for conveying gas, steam or water in factories or other buildings; distinguished from "tube" technically by being sold always by the inside diameter, and less carefully made as to quality of raw material than tube, which is known by its outside diameter. The usual diameters are ⅛″, ¼″ ⅜″, ½″, ¾″, 1″, 1¼″, 1½″, 2″, 2½″, 3″, and by single inches to 14″ as an ordinary limit; usual lengths are 12 or 16 ft. Sizes under 1¼″ are butt-welded; above that limit they are lap-welded. They are tested to 200 lbs. per sq. in. in butt-welded pipe; to 2,000 for lap-welded. The usual process of manufacture is to roll plate to the required thickness and width if possible; heat and bend over by drawing through a curved orifice; reheat and weld over a ball under rollers; straighten by rolling between hyperboloidal rolls; cut off and test. See TUBE.

Pipe, or PIPE-VEIN. Form of ore deposit, of limited extent, showing a relatively marked elongation in one direction; not often met with except in a limestone country.

Pipe, or BUTT. English measure for wines, used also in other European countries; varying from 104 to 137 imperial gallons.

Pipe, INDIAN. *Monotropa uniflora.* Low white or pink herb of the natural family *Monotropaceæ*, native of N. America, growing as a saprophyte on decaying wood in forests; known also as Corpse Plant.

Pipes, TOBACCO. The custom of smoking tobacco originated in America, and has been diffused throughout the world since the time of the discovery. It was practically universal among the American tribes, and appears to have been practiced from remote antiquity. The earliest form of the pipe was doubtless a simple tube, such as was used in Mexico, and occurs in the mounds of Ohio. Its origin has been traced to the blowing tube, used by the shaman or medicine man to direct his breath, a potent agency in magical rites. Burning material is thought to have been placed in the tube, that the smoke might render the breath visible. Tobacco is only



Pipes of all Peoples.

one of several plants smoked by the Indians, and its first use may have been the result of a happy accident. The name is derived from an Arawak word of the Bahama dialect, tabake, referring to the pipe in which the tobacco was smoked. A great variety of forms exist among the American pipes. The first were doubtless made of reed and have disappeared. Stone and pottery were generally employed, especially the well-known Catlinite or pipe stone, which was quarried by the Indians at the Coteau des Praries in southwestern Minnesota. In general, the pipe was a ceremonial object in America, used in tribal rites. It was first brought to Europe by Ralph Lane, first Governor of Virginia, 1586, who gave it to Sir Walter Raleigh.

Pipe-Clay. Light-colored plastic clay, suitable for use in making earthen pipes. In California it is customary to call a clay of any color a pipe-clay, if found associated with a body of auriferous gravel.

Pipe-fish. See LOPHOBRANCHII.

Pipe Lines. 1. Long lines of water mains for the supply of a city. One at Rochester, N. Y., is nearly 30 m. in length. 2. Conduits for the transportation of oil, natural gas, etc. Companies chartered for the operation of such lines generally have the power of eminent domain conferred upon them, as their business is deemed impressed with "a public use." See PETROLEUM.

Pipe-Ore. Masses of bog iron ore, having a cylindrical or doubly conical structure, such as might be caused by the meeting of stalactites and stalagmites.

Piperaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 11 genera and ab. 1,025 species, widely distributed in tropical regions; called the Pepper family.

Piperic Acid. $C_{12}H_{10}O_4$. Mpt. 217°C. Long needles, insoluble in water; obtained by boiling piperine with caustic potash.

Piperidine. $C_5H_{11}N$. Liquid of strongly basic properties and the odor of pepper; bpt. 106°C.; derivative of pyridine. It occurs in pepper in combination with piperic acid in the alkaloid piperine, and is made by treating pyridine with nascent hydrogen.

Piperine. $C_{17}H_{19}NO_3$. Mpt. 128° C. Alkaloid occurring in different varieties of pepper. It crystallizes in prisms, and is decomposed by boiling alcohol into piperic acid and piperidine.

Pipestone. See CATLINITE.

Pipette. Glass tube open at both ends, terminating below in a narrow tapering point. There is usually blown in the tube a spherical or cylindrical bulb. A liquid may be introduced into it by direct immersion or by aspiration, and if the top be closed with the finger, the pipette may be transported from one place to another. By admitting the air, the liquid will run out, the rate of efflux being easily regulated by the finger.

Pipewort. Aquatic herbs of the genus *Eriocaulon*, natives of N. and S. America.

Pippi. GIULIO ROMANO (q.v.), who was called G. Pippi.

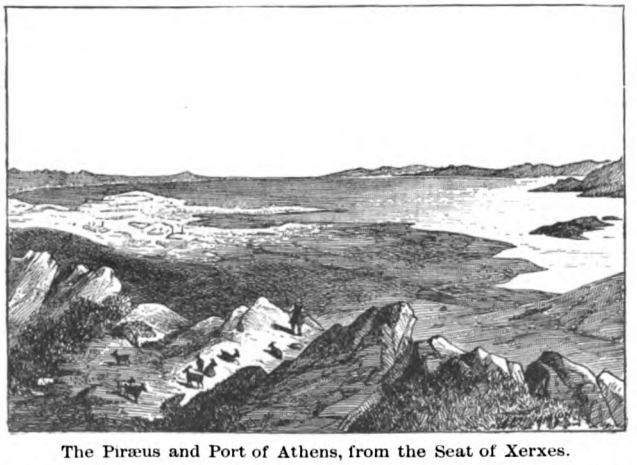
Pippin. See PEPIN.

Pipsissewa. *Chimaphila umbellata.* Low, evergreen, white-flowered plant of the natural family *Ericaceæ*, native of N. America; called also Prince's Pine.

Piquet. French game of cards, mentioned by Rabelais 1530, Twos to Sixes being discarded, played by two persons; eight cards are left in stock, for which the players may exchange, the non-dealer taking five and the dealer three. The counts for cards in hand are: Point, the longest suit; sequence of three or more cards in order of value, three cards counting 3, four 4, five 15, six 16, seven 17, eight 18; trio or quatorze of same denomination above nines, the former counts 3, the latter 14. The player having the best combination scores. Counts in play are 1 for each lead, 1 for each trick taken by non-leader, 2 for last trick, 10 for majority of tricks, 40 for all the tricks. If a player has no face card, he counts 10 for Carte-blanche; if he counts 30 before his opponent scores anything, he adds 30 for Pique; if he counts 30 in hand before his opponent scores anything, he adds 60 for Repique. Six deals make a game. The lowest score subtracted from the highest and 100 added to the remainder scores for the winner; if the loser has less than 100, the two scores and 100 are added together for the winner. This is the rubicon game of 1880.

Piracy. Robbery on the high seas; a crime by international law, which has been extended and regulated by modern statutes.

Piræus. Harbor of ancient and modern Athens; designed by Themistocles; anciently connected with Athens by 3 walls, now by a railway 5½ m. long. It sank into obscurity after 86



The Piræus and Port of Athens, from the Seat of Xerxes.

B.C., when Sulla destroyed its fortifications. It is called the Manchester of Greece, from its growth as a commercial center. Pop. ab. 36,000.

Piranesi, GIAMBATTISTA, 1711–1778. Italian architect and engraver; author of many fine plates of *Roman Antiquities*, and ab. 130 of modern buildings, pub. in 16 folio vols., 1743 and later.—His son, FRANCESCO 1748–1810, carried on the work.

Pirithous. Son of Zeus and Dia. His marriage to Hippodameia occasioned the battle of the Centaurs and Lapithæ. He went to Hades with Theseus to seize Proserpine, and was there detained in chains.

Piron, ALEXIS, 1689–1773. French poet and dramatist, noted for his epigrams. *La Métromanie*, 1738.

Pirouette. Rapid turn upon one foot, often repeated in dancing.

Pirry, or PIRRIE. Sudden gale, squall or pirouette of wind, larger than the little cat's-paw, and strong enough to damage small craft.

Pisa. Ancient Etruscan city of Italy, on the Arno; once a seaport, is now 5 miles from the sea; powerful in 11th cent., and active against the Saracens; crushed by Genoa 1284; ruled by Florence from 1406. The University, founded 1338, has ab. 750 students and 65 instructors, with a library of 120.000 vols. The Leaning Tower, built 1174, is of circular form, 180 ft. high, in eight stories; it is 58 ft. in diameter and inclines ab. 14 ft. from the perpendicular. The Baptistery dates from 1174; it is 180 ft. high, 160 ft. in diameter, and is crowned by a dome. Pop. of commune, 1893, 61,500. See LEANING TOWERS and BAPTISTERY.

Pisa, COUNCIL OF. Held 1409; called by 14 cardinals. It deposed and anathematized the rival Popes of Rome and Avignon, and elected a third, Alexander V. Its œcumenicity is not admitted.

Pisan, CHRISTINE DE, 1364–ab.1431. French poet and historical writer.

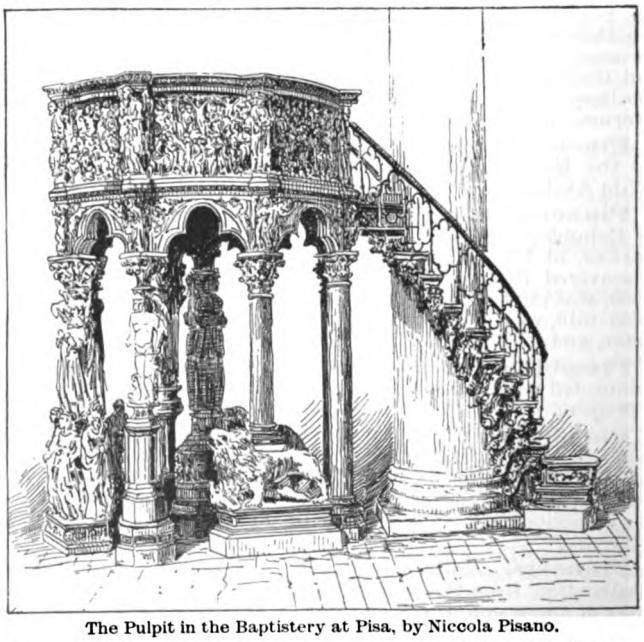
Pisander, 7th cent. B.C. or later. Greek epic poet. *Heracleia.*

Pisander. Leader of the oligarchical party at Athens; chief agent in establishing the Council of 400, 412 B.C.

Pisano (DE PONTEDERRA), ANDREA, 1270–1349. Italian sculptor, greatest pupil of Niccola P. His best work, and the most important of that age, is the earliest pair of bronze doors of the Florence Baptistery, with reliefs from the life of John the Baptist.

Pisano, GIUNTA, 1190–1236. Italian painter, pioneer of art free from Byzantine shackles.

Pisano, NICCOLA, ab.1206–1278. Earliest Italian sculptor to work in a professional spirit and to revive the science of the ancients in design. His great works are the pulpits in Pisa and Siena; the former (ab.1260) is more celebrated, as first in time and somewhat superior in the style of its relief composi-



The Pulpit in the Baptistery at Pisa, by Niccola Pisano.

tions. It has epoch-making importance for the later history of Italian art.—His son, GIOVANNI, 1250–1330, was more influenced by the northern Gothic, and less by the antique. He headed a school of artists whose relief works on the Cathedral facade at Orvieto are especially celebrated.

Pisano, or **Pisanello,** VITTORE, 1380–1456. Italian fresco-painter and medalist.

Piscary. The right or privilege of fishing. Common of piscary is the right of fishing in waters belonging to another person.

Piscataqua River. In New Hampshire, and is partly the boundary between Maine and New Hampshire. It is formed by the junction of the Salmon Falls and Cocheco Rivers.

Pisces. See ZODIAC.

Pisces (FISHES). Cold blooded, usually scaly, aquatic *Vertebrata*, with median fins and paired pectoral and pelvic fins. They breathe by means of gills borne on four to seven pairs of branchial arches, and they have a heart consisting of an auricle and a ventricle. Most are diœcious and oviparous; the female reproductive elements leave the body either by true oviducts (Mullerian duct) or by abdominal pores, or by a special ovarian duct, usually before fertilization takes place. The classes included are *Leptocardii*, *Cyclostomi*, *Selachii*, *Ganoidei*, *Teleostei*, and *Dipnoi*. There are ab. 8,000 species of fishes.

Pisciculture (FISH CULTURE). Broadly, as Aquæculture, this includes the protection, cultivation and propagation of aquatic animals (sponges, corals, leeches, oysters, lobsters, fishes proper, frogs, terrapin, whales, seals, etc.); ordinarily it is used in the narrower sense of the artificial hatching of the eggs of true fishes. By this means fishing grounds, that have become depleted through overfishing, have become so extraordinarily productive that laws restricting the freedom of the public in fishing have become unnecessary. Artificial fecundation and hatching of fish eggs (salmon and trout) was introduced 1748 by Jacobi of Westphalia, inaugurated in Italy 1791, France 1820, Britain 1837, Switzerland 1842, U. S. 1853. The first governmental hatchery was established in France 1850. Pioneers of fish culture in U. S. were Dr. Garlich and Seth Green. As the result of their work, Mass. established its fish commission permanently in 1865, and during the next 16 years 38 other States followed her example, led by New England, N.Y., and Pa. The U.S. Fish Commission was established in 1871 with Spencer F. Baird as chief, succeeded at his death 1885 by Marshall McDonald, who was succeeded in 1895 by G. Brown Goode. The first public hatchery was established in Mass. 1867, and by 1891 there were 46 State and 20 national hatcheries, for whose work that year $176,000 and $150,000 had been respectively appropriated. These stations distributed nearly a billion fish, stocking rivers, ponds, lakes and oceans. The same year Newfoundland distributed over half a billion fish, Norway a quarter billion, and the other states of Europe, mainly from hundreds of small private stations, about sixty millions. In 1895 the U. S. national hatcheries distributed 619,915,852 eggs and fry, of 30 species of fishes, including over 70 million lobster fry hatched at the Woods-Hole station, over 76 million shad, 125 million whitefish, 252 million pike-perch, and 60 million cod. The railways furnished 81,578 m. of transportation free. Probably the State hatcheries distributed approximately as many as the National Government. Of the notable triumphs of pisciculture may be mentioned the repletion of the Eastern shad fisheries and Western salmon fisheries, and the successful introduction of shad on the Pacific coast. Aquæculture is thus an important branch of, if not correlative with, Agriculture. As to technique of fish culture, the roe is secured from "ripe" females and milt from "ripe" male fish at the time of spawning and the two fluids are mixed, thus impregnating the eggs, which are then washed clean. If the eggs are heavy like trout eggs they are placed on gravel in long troughs over which a stream of water flows. Adhesive eggs, like those of perch, are fastened on single layer glass plates. Semibuoyant eggs, like those of whitefish, are kept in suspension by introducing water into jars from below. Shad eggs are hatched in special boxes with gauze bottoms, and kept moving up and down in the water. The period of incubation varies from months to hours according to species and temperature.

Piscina. In Gothic Architecture, properly a channel to carry away the water used for ablutions in the mass, but applied to the niche built to receive the channel and often very richly adorned with arched headings filled with tracery.

Piscivorous Dentition. Having teeth like those of fishes, small, numerous, and uniform.

Pise, CHARLES CONSTANTINE, D.D., 1802–1866. American priest and poet; knight of the Roman Empire; friend of Henry Clay, and chaplain U. S. Senate. *Father Rowland*, 1829; *Hist. Ch.*, 5 vols., 1830; *Alethia*, 1843.

Pisemskii, ALEXSEI, 1820–1881. Russian novelist and dramatist. *A Thousand Souls*, 1858.

Pisgah. Mountain e. of the Dead Sea, from whose peak Moses overlooked the Land of Promise.

Pisidia. Former region of s. Asia Minor, between Phrygia and Pamphylia. Its ancient inhabitants were mainly independent and lawless.

Pisistratus, d. 527 B.C. Became tyrant of Athens 560 B.C.; twice expelled; in power from 543 B.C. He enforced the laws of Solon, and ruled without oppression, and was succeeded by his sons.

Piso, LUCIUS CALPURNIUS, 2d cent. B.C. Latin annalist; once consul; victorious in Sicily; celebrated on coins of his family. Others of this house were eminent in war and statesmanship.

Pisolite. Variety of calcite, occurring in concretionary forms, the individual grains being about the size of a pea.

Pison, WILLEM, 1596–1681. Dutch naturalist, in Brazil 1637–45; discoverer of ipecacuanha, which he brought into use.

Pistachio-Nut, or GREEN ALMOND. Fruit of *Pistacia vera*, common in s. Europe. It is somewhat like the almond, but green. Lamb fattened upon the nuts is a delicacy.

Pistil. Female organ of reproduction in flowers, occupying the center of the blossom, and consisting of ovary, style, and stigma.

Pistillate. Flowers in which the pistils are present without stamens, or the stamens present and imperfect.

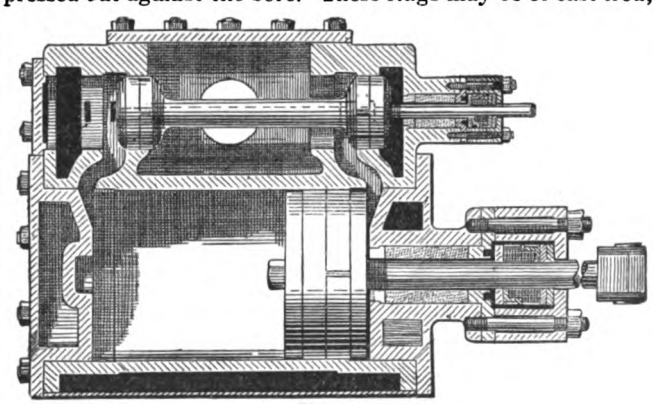
Pistillody. Transformation of other floral organs into pistils.

Pistoia. Town of Italy, 21 m. n.w. of Florence, which ruled it from 1306; scene of Catiline's defeat 62 B.C. Pop. ab. 21,000.

Pistol. Short single-hand firearm for use at close quarters, invented ab.1500 in Italy: replaced in military service by the REVOLVER (q.v.).

Pistole. Former Spanish gold coin of varying value, usually $10 or more.

Piston. Circular disk which reciprocates in a cylinder, whose bore it fits closely, and which separates the fluid of greater pressure on one side from that of less pressure on the other as it drives or is driven by that of greater pressure. The idea of utilizing a piston in a cylinder to be actuated by steam is due to DENIS PAPIN (q.v.), although the idea of the pump-piston seems to run much further back, to the earlier writers on hydraulics and pneumatics. The piston disk is usually much thinner than its diameter; it is either solid, or hollow, when it is called a box piston. It is in one piece, or in two. When in two pieces, the larger part to which the rod is secured, and which carries the radiating ribs which give it stiffness, is known as the spider, and the ring or disk which bolts over the cavities and mechanism of the spider is called the follower. In large vertical pistons, following an English precedent, it is called a junk-ring or bull-ring. To pack the contact of the piston disk with the bore of the cylinder, solid pistons or box pistons in one piece have grooves turned in their cylindrical surface, into which are fitted light rings which are pressed out against the bore. These rings may be of cast iron,



Piston.

steel, or brass, or brass with Babbitt-metal buttons or pockets. They may be forced out by their own elasticity, being turned as for a cylinder larger than the one in which they are to work; a cut then being made in the circumference, makes it possible to spring them into place in the smaller bore, so that they press outward when at work. Or there may be a spring ring put behind the packing ring to force the latter out, or steam may be let in behind the ring into the groove and press the segments of the ring radially outward. In follower pistons the springs are often arranged to be adjustable radially by nuts on studs when the follower is off, or wedges are used for adjustment. For air pistons metal rings are used where the air is to be much heated by the compression; but leather answers for low pressures. For water, either brass rings, or cup-leathers, or some of the manufactured canvas and rubber packings are approved. Grooved pistons without packing rings are practicable with liquids, and with gases also, if the piston be

made so long that the stroke is completed before the pressure has had time to leak and fill the grooves near the end where the lesser pressure is.

Pit. English coal mine.

Pita-Hemp. Name of the AGAVE (q.v.) fiber. It is used in making ropes and artificial hair-cloth.

Pit and Gallows. In Scotland, a phrase in old grants of criminal jurisdiction, as signifying authority to drown or hang offenders; women in consideration of their sex were drowned in a pit.

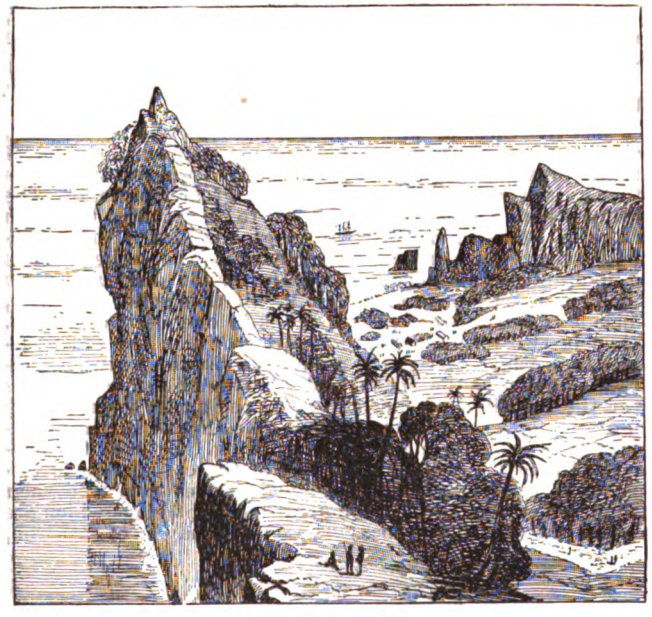
Pitaval, FRANÇOIS GAYOT DE, 1673–1743. French compiler of the noted *Causes Célèbres*, 20 vols., 1734–43, and of other works.

Pitcairn, JOHN, ab.1740–1775. British major, engaged at Lexington and Concord; killed at Bunker Hill.

Pitcairn, ROBERT, 1793–1855. Ed. *Criminal Trials in Scotland*, 4 vols., 1830–33.

Pitcairne, ARCHIBALD, 1652–1713. Physician in Edinburgh; medical writer, satirist of the Kirk, and Latin poet.

Pitcairn Island. In the Pacific; lat. 25° 3′ S., long. 130° 7′ W.: discovered 1767; colonized 1790 by nine mutineers from the



Pitcairn Island.

Bounty with some Polynesian men and women. The colony was discovered 1808. Many were removed to Norfolk Island 1856, when they numbered 198. See BOUNTY, MUTINY OF THE.

Pitch. Black residue obtained by boiling down the tar from the charring of wood. It is used in calking vessels.—Also the residuum from the distillation of coal tar, used in mixtures for pavements.

Pitch. In Acoustics, that characteristic of sound which is directly dependent upon the number of vibrations made per second by the sounding body. The term is qualified by the adjectives high and low, which indicate a comparatively large or small number of vibrations per second. The range of pitch perception in the human ear is from 32 to ab. 40,000. See SCREW.

Pitch. In Architecture, the slope of a roof. This depends largely upon climate and is in general, in original styles of architecture, steeper in Northern than in Southern countries. The Grecian pitch in the Parthenon is of about 16 degrees, the Roman about 22, while in rigorous climates the pitch may be of 60 degrees or even steeper.

Pitch. In Mining, angle which the axis of an elongated body of ore makes with the plane of the horizon; it may or may not coincide with the dip of the vein in which the ore occurs.

Pitch. Kind of ALL FOURS (q.v.), in which no trump is turned, the first suit led being considered the trump.

Pitch. Measure of length; of various meanings in engineering. The pitch of rivets in a joint of a boiler or a riveted girder is the distance from center to center of the holes. Small rivets with a small pitch are used to insure tightness, while large rivets with a large pitch are preferable for strength. The pitch of a helix or screw is the distance measured parallel to the axis between the successive coils of the same helix, or the threads of the same screw. It is the distance through which the screw would move in one revolution if the nut is held fixed. If the water were not mobile, the screw vessel ought to advance through the pitch of its propeller in one turn of the shaft. The pitch of teeth in a gear wheel is used in two senses. Circular pitch is the distance from a point of one tooth to the same point on the next, measured on the pitch circle of the wheel, and is a concrete number with the inch and its fractions as unit. Diametral pitch is the number of teeth per inch of pitch diameter of the wheel, and is an abstract number, usually greater than one, and rarely fractional. While the circular pitch has to be used in drawing tooth-profiles, the shop manipulation and all calculations are much simplified by the use of the diametral pitches.

Pitchblende. Massive variety of the mineral uraninite, found in Bohemia associated with certain silver ores.

Pitch Faced Masonry. Masonry formed of stones squared but not smoothly dressed, the front lines of the joints, or pitch lines, being cut so as to be in the same vertical plane when laid.

Pitcher. In Botany, hollow leaves or phyllodia; ascidium.

Pitcher Plants. In e. N. America, marsh plants of the genus *Sarracenia*, bearing hollow leaves, or ascidia. The com-

Pitcher Plant.

mon *S. purpurea* is known also as Side-saddle flower and Huntsman's-Cap. Among other Pitcher plants are the *Nepenthes* of Malaya and *Chrysamphora* of California.

Pitching Pennies. See HEADS AND TAILS.

Pitch Lake. See TRINIDAD.

Pitch Pot. Ceremonial game of remote antiquity in China, in which the players throw small arrows by hand into a pot or vase. Each player had four arrows. The game survives in Corea, where it is played ceremonially by the ki-saing or singing girls.

Pitchstone. Glassy rock, usually greenish or reddish, and pitch-like or resinous in luster. As to its origin there is diversity of opinion, but probably it is an eruptive product, analogous to obsidian.

Pitch Surface. In a pair of gear-wheels with teeth, it is the surface which would have been the surface of contact had the transmission been by friction of surfaces only and with the same ratio of the angular velocities of the two shafts. In spur wheels the pitch surface is a cylinder, in bevel-wheels a cone, in skew-bevel wheels a hyperboloid, in screw-gear a cylinder. A plane normal to the axis of a wheel cuts a pitch-line from the surface, and upon these pitch lines the design of the tooth-profiles is begun.

Pith. Central portion of an exogenous stem, composed of soft tissue, parenchyma; also known as Medulla.

Pithecanthropus. Fossil found 1894 in Java, and believed to represent a form intermediate between the apes and man.

Pitheci. See SIMIADÆ.

Pithecidæ. See PLATYRHINA.

Pithecus. See ANTHROPOMORPHA and SIMIA.

Pithom. Provision depot in lower Egypt; built by the Israelites for Rameses II.; identified 1883.

Pitman, SIR ISAAC, 1813–1897. Author of a system of short-hand which has mostly displaced its predecessors; knighted 1894. *Phonography*, 1840; *Reporter's Companion*, 1853.—His brother, BENN, b. 1822, settled in the U. S. 1853, reported the great political trials of 1865–67, and pub. a *Manual*, 1855, and other books.

Pitot's Tube. Bent tube inserted in a stream with one arm vertical and the other parallel and opposed to the current, so that the velocity of the current is indicated by the height of water in the vertical arm above the surface of the stream.

Pitra, JEAN BAPTISTE, 1812–1889. French priest, Cardinal 1863; librarian of the Vatican 1869; Bp. of Frascati 1879. *Spicilegium Solesmense*, 5 vols., 1852–60; *Juris Eccl. Græcorum Monumenta*, 1864–68; *Hymnographie Grecque*, 1867.

Pitrè, GIUSEPPE, b. 1841. Sicilian student of folklore. His collections since 1870 include some 30 vols., and are highly valued.

Pit River Indians. See PALAIHNIHAN INDIANS.

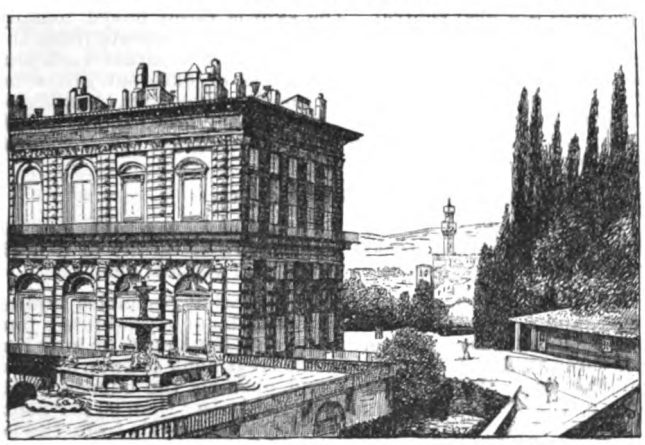
Pitscottie, ROBERT LINDSAY OF, 16th cent. Scottish chronicler. His book extends 1460–1565, and was prized by Sir W. Scott.

Pitt, WILLIAM. See CHATHAM.

Pitt, WILLIAM, 1759–1806. 2d son of Lord Chatham; M.P. 1780; Chancellor of the Exchequer 1782; Prime Minister 1783–1801 and 1804–5. In the earlier period he overcame strong opposition, accomplished many reforms, and wielded immense power; the later period was disastrous. His talents were not for war.

Pittacus, 652–569 B.C. Ruler of Mytilene 589–579; poet; one of the traditional Seven Wise Men of Greece.

Pitti Palace. At Florence; built in the 15th century by Brunelleschi (the rear a century later by Ammanati). After



Pitti Palace from the Gardens.

1530 it became the residence of the Medici, and contains as the result of their purchases the finest picture gallery in the world.

Pittosporaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 10 genera and ab. 90 species, mostly trees and shrubs, distributed throughout Australia.

Pittsburg. City of Allegany co., Pa., at the junction of the Allegany and Monongahela, between the two and opposite Allegany City. Here Fort Duquesne was built by the French 1754, and Fort Pitt by the English 1759; near by Braddock was defeated 1755. The borough was chartered 1804, the city 1816. It has extensive railroad connections and navigation upon the Ohio, Allegany and Monongahela. It is the commercial and manufacturing center of the great bituminous coal field of Pa. Its manufactures, which are almost entirely of iron and steel, are very extensive; product ab. one-fifth of total of U. S. The glass works produce one-fourth of total window glass of U. S. Pop., 1890, 238,617.

Pittsburg Landing. See SHILOH.

Pittsfield. Capital town of Berkshire co., Mass., in the valley of the Housatonic among the Berkshire hills, at an elevation above sea of ab. 1,180 ft.; chartered 1890. It has two railroads and some manufactures. Pop., 1890, 17,281.

Pittston. City of Luzerne co., Pa., on e. bank of the Susquehanna, 8 m. above Wilkesbarre; settled 1770; chartered as a borough 1853, as a city 1894. It is surrounded by coal mines. Pop., 1890, 13,302.

Pituitary Body. See HYPOPHYSIAL GLAND.

Pit Villages. Earth caves covered with stones or earth, used by prehistoric races in n.w. Hampshire, Eng. They are pear-shaped, from 20–40 ft. long, 10–15 wide, and 5 high.

Pity. That form of sympathy which leads us to feel pain at the sight of pain, and to be desirous of relieving it.

Pityriasis. Name applied to several forms of inflammations of the skin characterized by the exfoliation of scales. These are paper-like in appearance and not with a mother-of-pearl luster, which is one point of difference from another skin affection, PSORIASIS (q.v.).

Pius I. Bp. of Rome ab.140–ab.156.—II. ÆNEAS SYLVIUS PICCOLOMINI, 1405–1464. Sec. Council of Basel 1435; Cardinal 1456; Pope 1458; eminent for learning, ability, and zeal for the delivery of Constantinople from its Turkish captors; author of letters and historical works.—III. FRANCESCO TODESCHINI, Pope Sept. to Oct. 1503.—IV. GIOVANNI ANGELO MEDICI OF MILAN, 1499–1565. Abp. of Ragusa; Cardinal 1549; Pope 1559; uncle of St. Charles Borromeo. He reopened the Council of Trent 1562.—V. MICHELE GHISLIERI, 1504–1572. Dominican and inquisitor; Pope 1566; canonized 1712.—VI. GIOVANNI ANGELO BRASCHI, 1717–1799. Cardinal 1773, Pope 1775. After years of activity, his dominions were curtailed by the French revolution and the victories of Bonaparte, and himself carried prisoner to France 1798.—VII. GREGORIO LUIGI BARNABA CHIARAMONTI, 1742–1823; Bp. of Tivoli and Imola; Pope 1800. He crowned Napoleon 1804, was deprived of his estates 1809, and held a prisoner till 1814.—VIII. FRANCESCO XAVERIO CASTIGLIONE, 1761–1830. Pope 1829.—IX. GIOVANNI MARIA MASTAI-FERRETTI, 1792–1878. Abp. of Spoleto 1827, of Imola 1832; Car-

dinal 1840; Pope 1846. His was the longest pontificate and one of the most momentous. At first inclined to liberalism, he was driven from Rome 1848, and restored by French arms 1850. The States of the Ch. was incorporated in the Kingdom of Italy 1860, and in 1870 the last vestige of the temporal power disappeared. The Vatican Council assembled Dec. 1869, decreed his official infallibility, July 13, 1870. From Dec. 1870 he was professedly a prisoner in the Vatican.

Pi-utes. See SHOSHONES.

Pivot. BEARING (q.v.) for a shaft, arbor, axis, or mandrel exposed to thrust endwise. In horology it is the entire bearing of a small wheel arbor upon the disk of its jewel. Pivots are usually conical for light pressures, or are made with the Schiele curve, whose profile is the tractrix. Spherical or cup-shaped pivots allow for defective alignments, and for heavy pressures flat surfaces give best results. Special provision must be made for the lubrication of such pivots, else wear and cutting result. See FOOT-STEP.

Pivot Bridge. See DRAW BRIDGE.

Pixy. In rural England, fairy. It has been suggested that the stories of fairies are legendary survivals of a prehistoric people of diminutive stature, who are asserted to have lived in early times in Europe.

Pizarro, FRANCISCO, ab.1471–1541. Spanish discoverer, with Almagro, of Peru 1527, and its conqueror 1532–33, as much

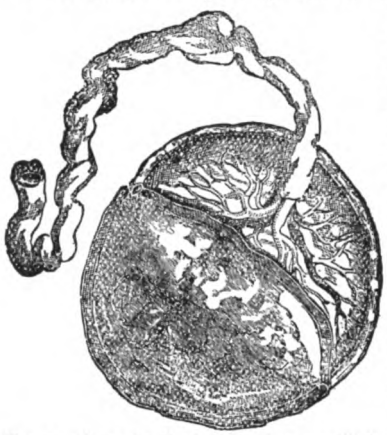
by treachery and cruelty as by valor; murderer of the Inca; founder of Lima 1535; made Marquis. In 1538 he defeated and beheaded Almagro, whose friends assassinated him.—His half-brother, GONZALO, ab.1506–1548, bore part in the conquest, became Gov. of Quito 1540, rebelled against the viceroy Vela 1544, slew him, and became master of Peru, and defeated another royalist army, but was deserted near Cuzco, and beheaded.—HERNANDO, 1474–1578, and JUAN, ab.1500–1536, were also partakers in the conquest. The former went to Spain 1539, and was in prison 1540–68.

Pizzicato. On instruments of the violin tribe a note is said to be played pizzicato when the string is set in vibration by being pinched or plucked by the finger.

Placability. Readiness to grant pardon to those who have offended or injured us.

Placebo. Inert substance given as a medicine when administered for its psychic effects; *e.g.*, bread pills.

Placenta. Organ by which the mammalian fœtus receives nourishment from the blood-vessels of the mother. It is formed of tufts or villi from the united chorion and allantois, that interlace with special vascular growths of the walls of the uterus. When the uterine membrane is torn away with the rest of the placenta at birth, the placenta is deciduate. The villi may be over the whole surface of the chorion, as in the diffuse placenta of Ungulates and whales, or in patches (cotyledons) as in Ruminants, or in a belt around the chorion, as in the zonary placenta of *Carnivora*, or on a disk-shaped area, as in the discoidal placenta of woman.—In Botany, those portions of the interior surface of the ovary or pericarp on which ovules or seeds are borne.



Human Placenta (half of it being split in two) and Umbilical Cord.

Placentalia (EUTHERIA MONODELPHIA). Section of *Mammalia*, characterized by the presence of a placenta during fœtal development. This may be deciduate or non-deciduate, and thus we get the sub-groups ADECIDUATA and DECIDUATA (q.v.). In these forms the vagina is single or uncleft, although the uterus is, except in the highest forms, strictly double.

Placer. Surface accumulation of sand or gravel containing gold, platinum, or other valuable metal.

Place-Value. That given to a commodity by its transportation from a place where its value is small to one where this is greater. Its creation is the chief function of commerce.

Placide, HENRY, 1799–1870. American comedian.

Placido. See VALDES, GABRIEL.

Placidus, LUCTATIUS, 5th cent. Latin commentator on old authors. His *Glossæ* on Plautus, etc., are of philological value.

Placitum Regium. Royal supervision of or interference with papal bulls, briefs, etc.; formerly exercised, or its right asserted, in England by the statute of Præmunire, in France by the Pragmatic Sanction.

Placoderms. Placoganoid fish, eminently characteristic of the Devonian, of a strange and extinct type, having heads and anterior portions of the body protected by bony plates, and the posterior either naked or covered with angular, enameled scales. Huxley has compared the bony armor of some of the Placoderms with that of the plated Siluroids, and Newberry, from a study of *Dinichthys*, has pointed out their relationship to the modern *Lepidosirens* (Mud-fishes). Probably, like these, they had lungs as well as gills, and were carnivorous. See DINICHTHYS, TITANICHTHYS, COCCOSTEUS, PTERICHTHYS, and ASTEROLEPIS.

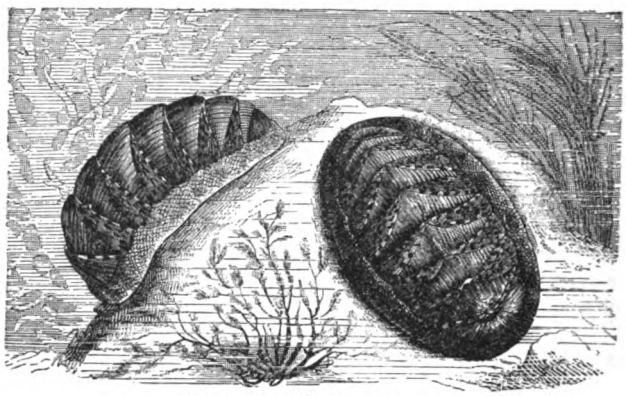
Placoganoid. Ganoid fish, with the head and more or less of the trunk protected by large ganoid plates, and having heterocercal tails. The term embraces one of the oldest types of fishes, the Placoderms. *Ostracostei* and *Chondrosteidæ* are included.

Placoid. Fish with the skin rough like the shagreen of the sharks and skates.

Placoidei. See ELASMOBRANCHII.

Placoid Scales. Small scales in the skin of sharks which constitute shagreen. They have a core of dentine, which is covered by enamel, as in teeth.

Placophora, or POLYPLACOPHORA. Sub-order of *Prosobranchiata*, including Mollusks having symmetrical, worm-shaped bodies, without eyes and tentacles. The ventral surface is flat; the dorsal is covered by a series of eight calcareous plates, arranged segmentally. Gills and kidneys are paired. *Chiton* is the sole genus included.



Placophora (*Chiton elegans*).

Plagæ. Stripes of color on the head of birds.

Plagiaulax. Small extinct polyprotodont mammal, supposed to combine marsupial and other characters; found in the Middle Purbeck beds (oölitic) of England. Its teeth had seven conspicuous grooves on the crowns.

Plagioclase. All feldspars that are triclinic in crystallization.

Plagiostomi (PLAGIOSTOMATA, DIPLOSPONDYLI, SQUALIDES). *Selachii* with mouth placed far back under the snout; the nasal apertures are also ventral. The skin is rarely naked, usually shagreen-like. The palato-quadrate bar is separate from the skull. There is a reduced notochord, and separate vertebral bodies. There are five or more pairs of external gill slits. Three tribes are included, the Sharks (*Squalides*, *Squali*, or *Selachii* in a restricted sense), the Rays (*Raiæ*, *Rajides*, *Battides*), and the Port Jackson Shark, *Cestracion* (*Cestraphora*, *Heterodontidæ*).

Plagiotremata. See LEPIDOSAURIA.

Plagiotropic. In Plant Physiology, vegetable organs (such as certain rootstocks) which grow naturally in a horizontal or inclined position rather than a vertical one.

Plague. The Oriental Plague somewhat resembles typhus fever, and is generally attended with glandular swellings (buboes). Fatal cases may terminate in a few hours, or may linger three to five days. No specific treatment is known; good nursing, food and stimulants and opening the buboes is all that can be done. The fatality is rarely less than 60 per cent. It seems to have been known in Egypt and Syria from the 3d century B.C. In 123 B.C. a million persons are said to have died from it in Africa. In 542 it broke out in Pelusium, spread to Constantinople, where 10,000 died in one day, and appeared in Gaul 546. The Black Death of the 14th century came from Tartary (according to Russian chroniclers, from China), and overran Asia Minor, Egypt, n. Africa, and most of Europe. It reached England 1348, where outbreaks occurred also 1361 and 1368. In England three-fourths of the population are thought to have been taken off; in Europe, one-fourth of the people, or 25,000,000 in all. Europe was visited repeatedly in the 15th and 16th centuries. In Moscow and vicinity 200,000 died 1570; 50,000 at Lyons 1572; 70,000 at Venice 1576; 1,000,000 in Egypt 1603; 300,000 in Naples 1656; 60,000 in Genoa, 50,000 in Amsterdam 1663–64. The Great Plague of London occurred 1665, and swept off 68,596 of 350,000, though two-thirds of them are believed to have fled the city. The Great Fire of 1666 is thought to have been the cause of the immunity of London in the years succeeding, although the epidemic raged in various cities and countries of Europe till ab.1750, and in some localities in s.e. Europe till ab.1840. Its latest outbreak on European soil was in 1878 on the banks of the Volga. In 1896–97 an epidemic of the plague occurred in India.

Plagues OF EGYPT. Called down by Moses to overcome Pharaoh's tyrannical obstinacy, and induce his consent to the departure of his serfs the Israelites. Whether they were miraculous or not is matter of controversy. See Exodus vii.–xii.

Plain. Comparatively level tract of land. In a general sense it may be applied to a large proportion of the earth's surface. When applied to small areas its use is more restricted. There are numerous varieties of plains, which are distinguished by climate and vegetation. Among them are the Great Plains of N. America, which are treeless, with a sparse covering of grasses; the pampas and prairies, which are mainly grass-covered; the llanos of Venezuela, which are an utter desert in the dry season, but covered with flowers and grass in the rainy season; the steppes of Siberia, grass-covered in the early summer, bare and desolate through the long severe winter; swamps and marshes; tundras, which, frozen to a great depth, thaw on the surface in summer, and are then covered with wet, spongy mosses.

Plainfield. Suburban city of Union co., N. J., 24 m. w.s.w. of New York; chartered 1869. Pop., 1890, 11,267.

Plain Chant, or PLAIN SONG. Unisonous Ch. music used from time immemorial. It was first transmitted by oral tradition, but it is thought that efforts to systematize and conserve the melodies were made by St. Ambrose, whence the name Ambrosian Chant applied to some of the melodies. The nature of his work, like that of Gregory (see GREGORIAN CHANT) is not understood, and much that is told of them has been proved to be legendary.

Plains, THE. See GREAT PLAINS.

Plaintiff. Person who complains in court of a legal wrong. He is *nominal*, when he has no interest in the suit; *legal*, when he has the legal title to the cause of action; *equitable*, when he may sue in his own name in equity, but not at law; *in error*, when he appeals from the decision of an inferior court.

Plaited. See PLICATE.

Plakula. Two-layered, flat embryo, as in nudibranch Mollusks; a form of the morula, considered primitive by Bütschli.

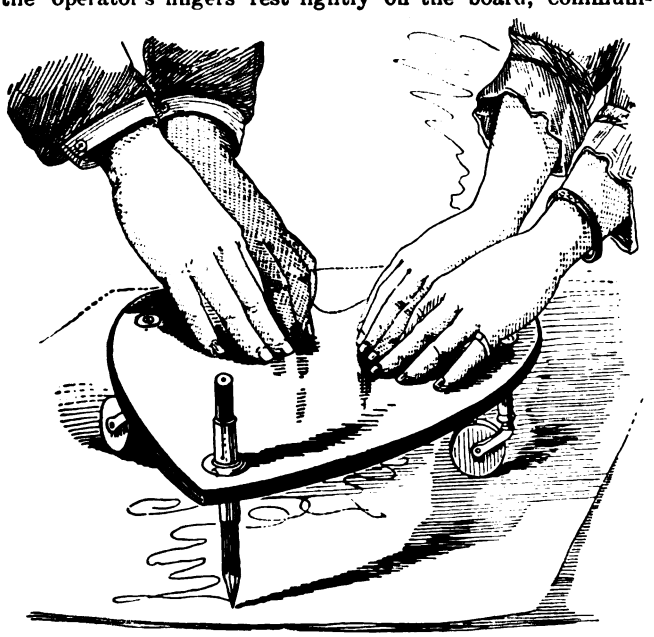
Plan. In Architecture, the drawing showing a horizontal section of a building and indicating its walls and other supports. This is sometimes called the ground plan, the term Plans being applied to all the drawings, including sections and elevations.

Planarians. Fresh-water, dendrocœlous, turbellarian worms. They have a long, oval, flattish body, provided with lobed processes or tentacles on the head, and with two eyes. Some live on land (*Geoplanidæ*) and have an external similarity to small slugs.

Planarida. See TURBELLARIA.

Planché, JAMES ROBINSON, 1796–1880. English playwright, and writer on heraldry and costume.

Planchette. Heart-shaped board, supported by two small wheels and the point of a lead pencil, with which, when the operator's fingers rest lightly on the board, communications are written. It appeared 1867, and became the craze of the day. Its oracles were supposed to have a supernatural origin; marvelous tales were told by the credulous about it, and eminent scientific men were drawn into the controversy concerning it. These writings are thought by some to be communications from the spirit world. They are, in fact, involuntary muscular movements, responding to mental action. A similar apparatus, consisting of the branch of a peach tree suspended over dry ashes, is used by priests in China in pretended intercourse with spirits.



Planchette.

Plancy, JACQUES ALBIN SIMON COLLIN DE, 1793–1881. French writer, chiefly on historical and legendary topics.

Plane. Surface such that a straight line joining any two points therein lies wholly in the surface; indefinite in extent; determined in position by means of its intersections, called traces, with planes of reference. These traces are straight lines, and thus two equations of two straight lines determine the plane.

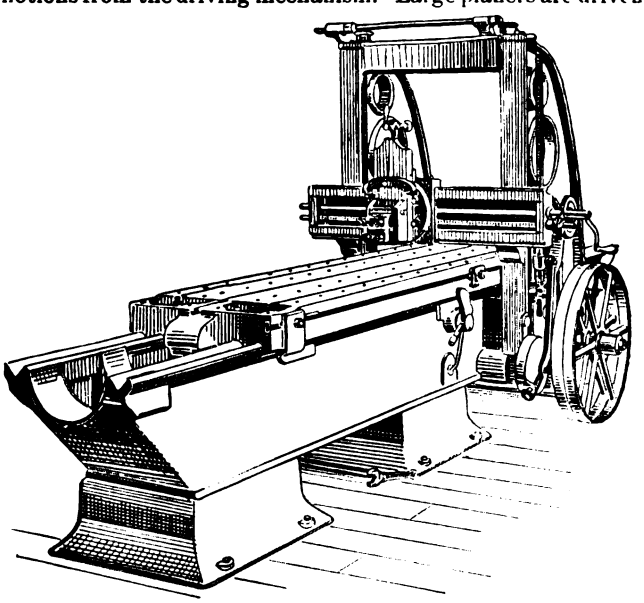
Plane Figure. One composed of points or lines in the same plane considered together. The notion of inclosed surface is not necessarily included.

Plane of Flotation. Cross-section of a floating body taken at the water level.

Plane of Polarization. See POLARIZATION.

Planer. Machine for producing flat, smooth, or plane surfaces in wood or metals. The wood-working planer appears in two types. The cylinder or parallel planer or surfacer (called also the Woodworth planer) has one or more revolving cylinders carrying long beveled knives, which act upon the lumber as it is fed against them by fluted feeding-rolls. The lumber slides upon the bed of the machine to which the axis of the cylinder is parallel, and the surface of the lumber is made parallel to that bed as it is pressed down upon it. The flexibility of the wood precludes that such planing of thin lumber shall plane it "out of wind." There may be vertical heads also for planing the edges of lumber, and a lower cylinder may be added, so that all four sides can be finished at one pass. The other type of wood planer is the carriage or Daniels planer, in which the lumber is dogged to a heavy carriage, moving on ways. The more exact type has the cutters revolving in a horizontal plane around a vertical axis, so that little or no downward pressure acts to spring the lumber, and they produce a plane surface parallel to the plane of the ways, and out of wind if the latter lie in a true plane. For more rapid work a cylinder cutter head has been adapted to the carriage system. For smoothing and surfacing, a buzz-planer is a machine with a revolving head and knives below the table; the work is held in the hands and fed over the head.

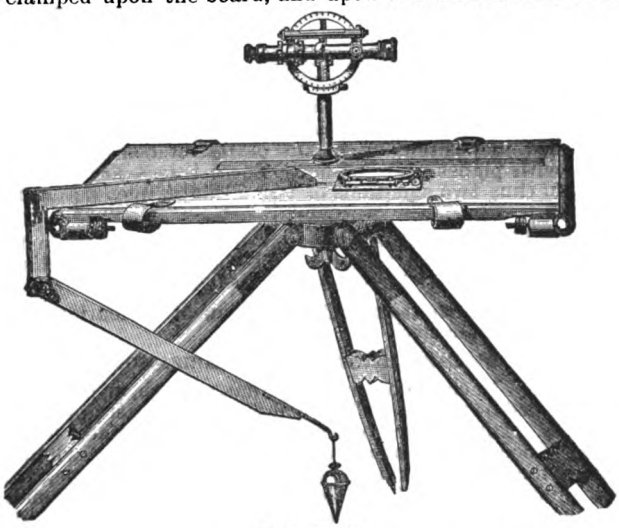
For metal work, the planers are all carriage planers, the work being clamped to a heavy bed which slides back and forth in V grooves in the frame. The tools are held upon a cross rail, truly parallel to the plane of the grooves, and receive feed motions from the driving mechanism. Large planers are driven by a rack under the table, which is moved by a train of spur gear or by a worm-gear which reduces the speed of the belt. To save time, they have a quick return motion, usually of ab. 2 to 1 or 3 to 2. Smaller planers are sometimes driven by a crank-motion. Flat surfaces can be produced horizontal, vertical or at an angle, the tools having feed-motions in these directions. The navy-yards have the largest planers in this country.



Iron Planer.

Planer-Tree. *Planera aquatica.* Tree of the Elm family, native of wet grounds in the s.e. U. S.

Plane Table. Ancient surveying instrument, consisting of a drawing board mounted upon a tripod. A sheet of paper is clamped upon the board, and upon it is a ruler with a telescope attached, so that a map can be made directly in the field. It is used extensively in topographical work where triangulation points are first established, these serving as stations by which the plane table work is controlled in accuracy.



Plane Table.

Planetarium. See ORRERY.

Planetoids. See ASTEROIDS.

Plane Tree. See BUTTONWOOD.

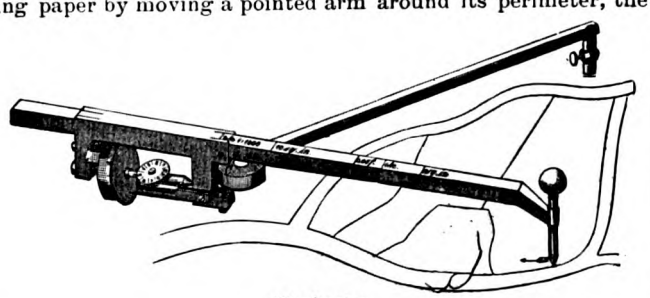
Plane Trigonometry. Treating of the elements of plane triangles, their relations and measurements. Right triangles are solved at once from definitions of the functions of the angles. In the general triangle the most important relations are expressed in formulas, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$.

$$\frac{a-b}{a+b} = \frac{\text{Tan } \frac{1}{2}(A-B)}{\text{Tan } \frac{1}{2}(A+B)}, \triangle\ a^2 = b^2 + c^2 - 2\,b\,c \cos A,$$

where A, B, C, are angles: a, b, c, the opposite sides.

Planets. Bodies like the earth, revolving in orbits about the sun. Our system consists of more than 400 such bodies, at present known; viz., 8 large planets, 21 satellites, and an indefinite number of asteroids or minor planets. A distinction is made between primary and secondary planets, the latter being satellites of the former. Previous to 1781 only six primary planets were known: Mercury, Venus, Earth, Mars, Jupiter, and Saturn. All these had been known from remotest antiquity, and though Kepler and others had drawn attention to the wide interval between Mars and Jupiter, the system seems to have been accepted as complete by universal consent. The discovery of Uranus by Herschel in 1781 therefore produced a great sensation. The subsequent addition of Neptune (1846) and about 400 asteroids completes the system as we know it. The announcement of a new planet now attracts no attention outside the astronomical profession. See MERCURY, VENUS, SUN, etc.

Planimeter. Apparatus for measuring an area on drawing paper by moving a pointed arm around its perimeter, the motion being communicated to a wheel whose revolutions determine the area; used extensively in measuring indicator cards, cross-sections of earthwork, and areas of fields.



Planimeter.

Planipennia. Sub-order of *Neuroptera*, including forms in which the two pairs of wings are alike, but cannot be folded, though they may overlap. The mouth parts are powerful chewing organs. The ant-lion is an example. The wingless larvæ live in funnels in the sand and are oval in shape, while the adults are slender, like Dragon-flies.

Planoblast. Gonophore set free from its hydroid stock; a medusa.

Planogamete. In Botany, motile cell which unites with another in conjugation.

Plant. A plant is an organism distinguished from an animal in possessing neither nervous nor muscular systems, and hence lacking the functions of sensation and voluntary motion. Its most abundant chemical elements are carbon, hydrogen, and oxygen, with which, in the animal, nitrogen is included. Its food is inorganic, chiefly carbon dioxide and water, while that of the animal is organic. In the process of assimilation the plant restores free oxygen to the air, and is thus a purifying agent; the animal requires oxygen and restores carbon dioxide, and is a polluting agent. In general terms plants are constructive and animals destructive organisms. These distinctions serve to discriminate all but the lowest organisms, among which the plant and animal kingdoms approach one another so closely that some living forms can only be assigned to one or the other with difficulty. Exceptions must be made also in the case of chlorophyllous plants which agree with animals in being more largely nitrogenous, in absorbing oxygen and in requiring organic food. There are not less than 200,000 species of plants. See BOTANY and ANIMAL.

Plantagenet. Angevin dynasty of English monarchs, 1154–1485; derived from Matilda, daughter of Henry I., and Geoffrey, Count of Anjou; displaced by the Tudors.

Plantaginaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 3 genera and ab. 200 species; distributed throughout all parts of the earth; called the Plantain family.

Plantain. Herbs of the genus *Plantago*, natural family *Plantaginaceæ*, of wide geographical distribution. Two species, the broad and narrow-leaved, are unsightly weeds in lawns and waste places about buildings. The broad-leaved is also a troublesome weed in clover fields, where it is commonly introduced with the seed and, once introduced, can scarcely be eradicated except by plowing the field.—The name is also applied to a tropical kind of Banana, *Musa paradisiaca*, which is eaten cooked.

Greater Plantain (*Plantago major*).

Plantain, INDIAN. Large perennial herbs of the genus *Cacalia*, natural family *Compositæ*, natives of the central U. S.

Plantain, MUD. *Alisma plantago-aquatica.* Aquatic herb of the natural family *Alismaceæ*, native of the n. hemisphere; known as Water Plantain.

Plantain-Eater (MUSOPHAGA). Cuckoo of the Ethiopian region in Africa. It has a general resemblance to a black domestic hen, both in size and color.

Plantation. Formerly, colony, sometimes penal; in the Southern States before the War, large estate tilled by slaves.

Plantigrada. See FISSIPEDIA.

Plantin, CHRISTOPHE, 1514–1589. French printer at Antwerp from 1555, with branches later at Paris and Leyden. His work was of the highest order, and includes some notable Bibles. His family continued the business till 1876, when the city purchased it and opened a museum on the spot.

Plant Jelly. See PECTIN.

Plant-Lice. See APHIDÆ.

Plants, FOSSIL. See PALÆOBOTANY and PALEONTOLOGY.

Planudes, MAXIMUS, 14th cent. Greek monk of Constantinople, who compiled the collection of shorter poems known as the Greek Anthology.

Planula. Ciliated embryo of Cœlenterates. It is unlike a typical gastrula, in that the hypoblast is formed by immigration rather than by invagination. It is usually solid at first.

Plasma. Bright green, slightly translucent, uncrystallized, chalcedonic quartz.

Plasmode (PLASMODIUM). Naked protoplasmic mass found in the Myxomycetes, or Slime-moulds. It consists of an aggregation of swarm-spores.

Plasmodiata. Section of *Gymnomyxa*, including the MYCETOZOA (q.v.).

Plasmodium. Mass of cells so fused together that the boundaries of the constituent cells are not present, or at least not apparent.

Plasmolysis. Artificial contraction of protoplasm.

Plasmosoma. Peculiar nucleolus present in cells, which has the power to leave the nucleus and become developed into a new cell, with nucleus, etc.

Plassey. In Bengal, 96 m. n. of Calcutta. Here Clive crushed the Hindus June 23, 1757, and laid the foundation of the English Empire in India.

Plassman, ERNST, 1823-1877. German sculptor and art teacher, in New York from 1853. *Gothic Ornaments*, 1875.

Plaster. Medicament consisting of one or several ingredients that is adhesive. It is spread upon cloth or other flexible substance and is applied to the skin.

Plaster of Paris. See CALCIUM SULPHATE and GYPSUM.

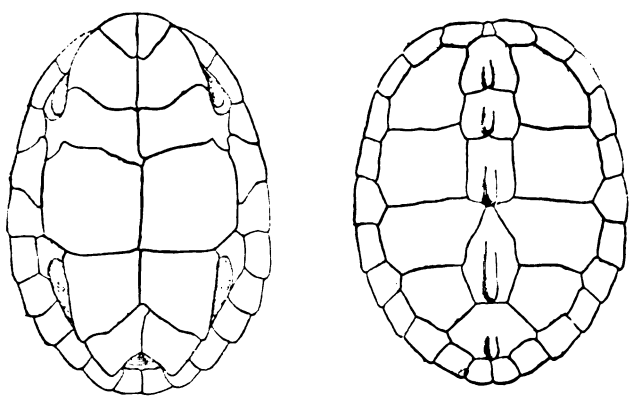
Plasticity. Opposite of rigidity. If a body be subjected to stress, and passively yields to strain without any increasing reaction as the stress is continued, it is said to be plastic. Plastic substances are capable of being molded or stamped, as clay, gold, and silver.

Plastide. Cell, whether nucleated or not. See CYTODE.

Plastids. Granules of various kinds, found in the protoplasm of growing vegetable cells, forming chlorophyll, starch, and other substances.

Plastidule. See PERIGENESIS.

Plastron. Ventral shield of Turtles, composed of nine dermal plates, an anterior pair of episternals (clavicles), em-



Plastron (left) and Carapace (right) of Tortoise, showing epidermal plates.

bracing a single median entosternal (interclavicle), a pair of hyosternals (hyoplastron), a pair of hyposternals (hypoplastron), and finally a pair of xiphisternals (xiphiplastron). These are covered by 6 pairs of epidermal plates.

Plat. In Vein Mining, a loading and storing place for ore, at the intersection of a shaft and a level; written also Platt and Tip-plat.

Plataea, or PLATÆÆ. City of Bœotia, destroyed by Persians 480 B.C.; scene of Spartan victory over Persians 479; destroyed by Spartans 429, and by Thebans 374; allied to Athens; famous for heroism and misfortunes.

Platanaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, including 1 genus and 6 species of trees, growing in the temperate and warm parts of the n. hemisphere; called the Plane-tree family.

Plata, RIO DE LA. Channel by which the Parana (conveying the waters of the Paraguay) and Uruguay reach the Atlantic; between Uruguay and Argentina. Length ab. 190 m., greatest width 143 m.

Plateau. Elevated plain, sometimes of great and diversified areas of elevation, as the Tibetan plateau of Asia. When smaller, it is generally an area horizontal or slightly inclined, of smooth surface, and bordered on one or all sides by cliffs. They generally occur in regions where, from climatic or lithologic reasons, stream erosion is much greater than superficial erosion. A small plateau is known locally in the s.w. U. S. as a Uesa, and a fragment of a plateau, left from erosion, as a Butte.

Plateau. In Botany, short flat axis which bears the scales of bulbs.

Plateau, JOSEPH ANTOINE FERDINAND, 1801-1883. Physicist; Prof. of Physics at Ghent 1835. *Persistence of Vision*, 1876; *Theory of Liquids*, 2 vols., 1873.

Platedware. See ELECTRO-PLATING.

Plate Girder. Bridge girder, formed by a solid plate web to which are riveted angles and smaller plates constituting the chords. It is mainly used for floor beams of bridges and for spans shorter than 100 ft., the longest thus far built being 120 ft. They are stiff and have the advantage that nearly all the riveting can be done in the shop.

Plate Glass. The materials of which this is made should be of good quality. One receipt is fine sand 100 lbs., calcium carbonate 25, sodium sulphate 42, carbon powder 2½, arsenious oxide ½; mixed with broken plate glass. This mixture is melted in a crucible, and the melted glass is poured upon an iron or bronze table, having a ledge around it, and smoothed to even thickness by an iron roller. It is then annealed in a furnace. The plate is then fixed to a revolving table with plaster-of-Paris, and arms with cast-iron rubbing plates revolve over it, smoothing it with sand, emery, and water. The other side is then smoothed. The plate is then polished by moving one plate over another with fine emery, rouge, and water, between them, the finishing being done by hand with felt-covered wooden polishing plates and rouge. France and Belgium are large manufacturers of plate glass. In U. S. the manufacture has largely increased, the Pittsburg district making 13,500,000 sq. ft. annually. There is a company in U. S. which insures plate glass against breakage.

Plate Marks. See HALL MARKS.

Platen-Hallermünde, AUGUST, GRAF VON, 1796-1835. German lyric, satirical, and dramatic poet.

Plate Powder. Prepared chalk and rouge, used for cleaning gold and silver articles. When mercury is added it makes a brilliant polish, but is very injurious to the ware.

Plater, GEORGE, 1736-1792. Patriot of Md., active 1776; delegate to Congress 1778-81; Gov. 1792.

Platetrope. One of two organs or structures of a living organism, symmetrically present on both sides of the body. Thus the right hand is a platetrope of the left; the two nostrils are mutually platetropes.

Platinic Bromide. $PtBr_4$. Dark-brown powder, soluble with difficulty in water, easily in alcohol; similar to platinic chloride; made by heating bromoplatinic acid and dissolving the residue in water. The corresponding iodine and fluorine compounds are known.

Platinic Chloride. $PtCl_4$. Yellowish-brown, crystalline substance, made by dissolving platinum in aqua regia and evaporating the product to dryness; soluble in water and alcohol; used in chemical analysis for determining potassium, with which it forms a double salt, $PtCl_4 2KCl$.

Platinotype. Photograph made from paper sensitized with a solution of ferric oxalate and chloroplatinite of potassium; it is developed by potassium oxalate, platinum being neposited on the paper.—Also, silver prints toned with platidum chloride.

Platinous Bromide. $PtBr_2$. Greenish-brown powder, soluble in hydrobromic acid; made by heating brown platinic acid to 200° C. The corresponding iodine and fluorine compounds are known.

Platinous Chloride. $PtCl_2$. Green powder, insoluble in water, made by heating platinic chloride.

Platinous Oxide. PtO. Black powder, made by precipitating platinous chloride with caustic potash and heating the hydroxide thus formed.

Platinum. Pt. At. wt. 195, sp. gr. 21.5, sp. ht. .032, valence II., IV., VI. and VIII.; mpt. 1,775° C.; discovered by Watson 1751, in gold-bearing sand from Columbia. Aqua regia dissolves it, forming H_2PtCl_6; ordinary reagents do not affect it; but it is acted upon by fusing alkalies, especially a mixture of caustic potash and saltpeter.

Platinum, METALLURGY OF. It is found native in flattened grains or small rounded lumps, in gold-bearing sands, accompanied by serpentine, quartz, zircon, spinel, corundum, titanic-, chromic-, and magnetic-iron ore, gold, and iridosmine. The platinum itself is never pure, but alloyed with iron, copper, and the so-called platinum metals, iridium, palladium, rhodium, osmium, and ruthenium. The principal producer is Russia and Siberia; the world's annual output is between five and six metric tons, and the market price is $225 per pound (Av.). Three methods of treating the ore are used. The first is to melt the metallic sand in a lime crucible under the oxy-hydrogen blow-pipe, using an oxidizing flame, and thus oxidizing and slagging off the impurities. The

metal thus obtained still contains any iridium or rhodium in the ore, and must be further treated by acids to obtain pure platinum. The second method is to alloy the platinum with lead. The ore is melted with lead sulphide on a hearth of bone-ash. There results an alloy of lead and platinum, which is treated in a cupellation furnace, driving off most of the lead, while the last of it is boiled off by heating in the lime furnace before the blowpipe flame. Rhodium and iridium likewise remain in platinum obtained by this method. The third process, which gives the purest metal, is to treat the ore with aqua regia, and from the solution precipitate the platinum as platinum-ammonium chloride by adding excess of ammonium chloride. The precipitate is filtered out, washed, dried, and ignited to powdery platinum, which may be melted or welded together. It is grayish silver-white, as soft as copper, very malleable and ductile, weldable at a white heat. It is very resistant to oxidation by air or moisture. Platinum foil absorbs 200 vols. hydrogen and 80 vols. oxygen at a red heat. Its principal uses are for incandescent electric-light conductors, chemical apparatus, in many scientific instruments, particularly electrical, and for sulphuric acid stills.

Platinum Ammonium Compounds. Double compounds of ammonium and platinum; salts of the general formulæ, $Pt(NH_3)_2M_2$, $Pt(NH_3)_2M_4$, $Pt(NH_3)_4M_2$, $Pt(NH_3)_4M_4$, in which M indicates acid residues or halogen atoms.

Platinum Black. Fine black powder, made by boiling platinous chloride with caustic potash and gradually adding alcohol. It absorbs 800 vols. of oxygen, but is less active after frequent ignition.

Platinum Dioxide, or PLATINIC OXIDE. PtO_2. Bulky brown powder, becoming black when heated; made by treating platinic chloride with caustic soda and heating the hydroxide thus formed.

Platinum Metals. Ruthenium, Rhodium, Palladium, Osmium, and Iridium.

Platinum Sponge. Gray spongy mass, obtained by igniting ammonium platinic chloride. It has the power of absorbing gases to a remarkable extent; it absorbs 200 volumes of oxygen.

Platinum Sulphides. These are two, PtS and PtS_2; black insoluble compounds, precipitated by passing hydrogen sulphide into solutions of platinous and platinic chlorides.

Plato, ab.427–347 B.C. One of the most celebrated of philosophers of Greece and of all time; pupil of Socrates and teacher of Aristotle; founder of idealism, and projector of an ideal republic. His philosophy marks a departure from the cosmological methods of his predecessors, and begins with the anthropological, and hence lays the foundation of psychology, ethics, politics, economics, and metaphysics. His life, apart from a brief period of travel, was spent peacefully at Athens, where he taught in the Academy. His chief works, the *Republic*, *Laws*, and ab. 40 minor dialogues (some are disputed), are models of purity and elegance of style. His influence has been immense on thinkers of every age and school: in this respect his pupil Aristotle is his only rival.

Plato.

Platoff, MATVEI, 1757–1818. Cossack officer, Hetman 1801; distinguished in the wars against Napoleon; Count 1812.

Platonic. Affection free from baser elements, superior to earthly and fleshly passion.

Platonic Year. Period required for the equinoxes to perform a complete revolution; ab. 25,800 years.

Platt, ORVILLE HITCHCOCK, b. 1827. U. S. Senator from Conn. since 1879.

Platt, THOMAS COLLIER, b. 1833. M.C. from N. Y. 1873–77; U. S. Senator March–May 1881 and 1897; long manager of the State Republican machine.

Platt-Deutsch, or LOW GERMAN. See GERMAN.

Platte River. Right hand branch of the Missouri, heading in two forks in the Rocky Mts. of Colorado and Wyoming, and flowing generally e. to its mouth, s. of Omaha. Drainage area 90,011 sq. m., length 900 m.

Plattner, KARL FRIEDRICH, 1800–1858. Prof. Freiberg, Saxony, 1842. In metallurgy he is best known for his researches on the roasting and amalgamation of gold ores, and the chlorination process for low-grade gold ores. *Blowpipe Analysis*, 1835.

Plattsburg, BATTLE OF. Sept. 11, 1814, on Lake Champlain. The American fleet under McDonough defeated the British, which was superior in guns and men. The British army on land retreated the same night. British loss, 2,500; American, 200.

Platyhelminthes (FLAT WORMS). Vermes with elongated, flat body, often possessing suckers and hooks. They have a cerebral ganglion, and are usually hermaphrodite. The orders included are *Turbellaria*, *Trematoda*, *Cestoda*, and *Nemertini*. See VERMES.

Platyphyllum. Genus of Devonian ferns, found with *Archæopteris;* having a creeping stem or growing parasitically on stems of other plants.—The fructification was marginal.

Platypus. See ORNITHORHYNCHUS.

Platyrhina. Group of *Simiadæ*, including the S. American Monkeys. They have the nostrils widely separated. A tympanic bulla is present. The tail is long, usually prehensile; there are no cheek pouches nor ischial callosities; and the fore-limbs are generally shorter than the hind-limbs, and have no opposable thumb. Their dentition is similar to man's except in possessing one more molar in each series. The families included are the *Pithecidæ*, without prehensile tails, and the *Cebidæ*, with prehensile tails more or less naked at the end. *Ateles*, the Spider Monkeys, *Mycetes*, the Howling Monkeys, and the nocturnal *Nyctipithecus*, with extremely large eyes, are examples.

Plauen. Manufacturing town of Saxony, on the Elster. Pop., 1890, 47,007.

Plautus, TITUS MACCIUS, ab.254–184 B.C. Greatest of Latin dramatists. His comedies, once numbering 130, were based on Greek models, but more fully adapted than those of Terence, and were extremely popular. 21 survive, among them *Captivi*, *Menœchmi*, and *Aulularia*.

Play. Active occupation of body or mind for purposes of amusement and without serious end. Active bodily play is characteristic of the youth of both man and the lower animals, and is an expression of the pleasure in muscular movement for its own sake; play also serves in this connection a definite biological end in strengthening the body at a plastic age and is conducive to general health. Play which requires mental exertion appears usually at a later age. Pure play may be modified up to the level of serious business by the introduction of the element of gain following upon the attainment of a certain end, as in gambling with cards or playing for wagers.

Playfair, JOHN, 1748–1819. Prof. Mathematics at Edinburgh 1785. In his later years he applied himself to Geology, and in 1816 went to the Alps to study their origin. He identified himself with the Plutonists, and in his *Illustrations of the Huttonian Theory of the Earth*, 1802, and other works did much by his force and eloquence to bring into repute views then decreed heretical.

John Playfair.

Playfair, LYON, LORD, LL.D., F.R.S., b. 1819. Prof. of Chemistry in London Royal Institution 1843, and at Edinburgh 1858; M.P. 1868; member of several cabinets since 1873; knighted 1883; Baron 1892. *Food of Man*, 1865; *Teaching*, 1872; *Science*, 1885.

Playford, JOHN, 1623–1693. English publisher of *Breefe Introduction to the Skill of Musick*, 1654, which had great vogue for more than a century.

Playing Cards. See CARDS.

Plays. See DRAMA.

Plea. Defendant's answer to a charge.

Pleading. Formal statement of his case by a litigant; generally required to be in writing. Common-law pleading was highly technical, but equity pleading was not: the latter has furnished a model for the system of pleading under modern codes.

Pleasants, JAMES, 1769–1839. M.C. 1811–19; U. S. Senator 1819–22; Gov. of Va. 1822–25.—His son, JOHN HAMPDEN, 1797–1846, edited the Richmond *Whig* from 1824.

Pleas of the Crown. Criminal suits in which the crown is prosecutor.

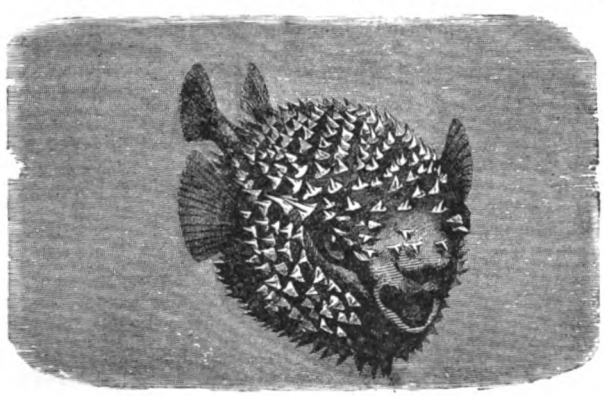
Pleasonton, ALFRED, U.S.A., 1824–1897. Brig.-gen. U. S. Vols. 1862, Major-gen. 1863; distinguished at Chancellorsville, Gettysburg, and in Mo. 1864.—His brother, AUGUSTUS JAMES, b. 1808, Brig.-gen. of Pa. militia 1861, was noted for experiments with blue glass. *Influence of the Blue Ray*, 1876.

Pleasure. Sensation felt when our desires are satisfied or in some measure gratified. See PAIN AND PLEASURE.

Plebeians. Roman families sprung from ancestors of foreign birth, who could not at once acquire admission to the full rights of citizenship, or from manumitted slaves or clients of the first full burghers.

Plebiscite. In France, popular vote, yes or no, on a proposition submitted by the executive: usually taken without opportunity for discussion, as 1851–52 and 1870.

Plectognathi. Sub-order of Physoclist fishes that have the body globular, or laterally compressed, the maxilla and



Sea Hedgehog (*Diodon hystrix*).

premaxilla fused and immovable. The dermal armor is strong and often spiny. Pelvic fins are usually absent. The gills are comb-shaped. There are two tribes, *Sclerodermi*, whose jaws have separated teeth, of which *Ostracion*, the Trunk-fish, is an example, and *Gymnodontes*, with jaws modified into a beak. The Puffers, or Globe-fish, and Sea Hedgehogs belong here. (*Tetrodon*, with smooth or prickly skin, and *Diodon*, with erectile spines.) These fish can inflate themselves until they become nearly ball-shaped, while the Trunk-fish has a stiff box-like armor of fused plates, forming a wedge-shaped case, the widest part of the wedge being at the belly.

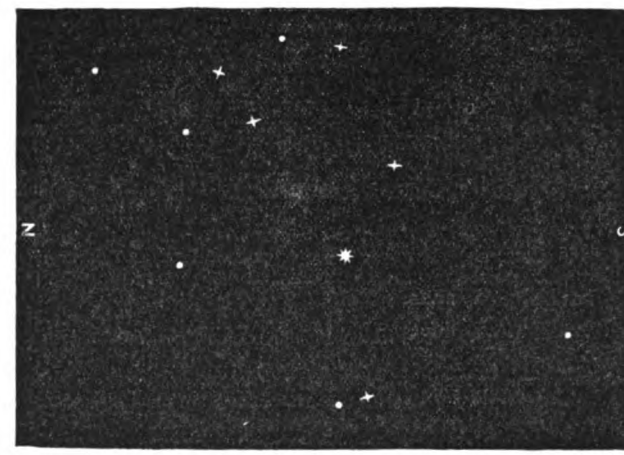
Plectospondyli. See EVENTOGNATHI.

Plectrodus. Formerly considered the jaw of a fish; now known to be the cheek spine of the Upper Silurian *Eukeraspis*.

Pledge. Delivery of goods as security for a debt, to be redelivered to the pledger upon satisfaction of the debt. The pledgee must take ordinary care of the goods, account for any profit derived therefrom, may sell after default and due notice to pledger, and apply proceeds to payment of the debt.

Pleiade. Group of seven Green poets, so named by Ptolemy Philadelphus 3d century B.C.—Group of seven French poets of 16th century. Ronsard was the chief.

Pleiades. Seven daughters of Atlas and companions of Diana, one of whom was invisible; pursued by the hunter Orion, they were changed into doves and placed among the stars.—Cluster of stars in the constellation Taurus, called the Seven Stars, though only six are visible to the eye, the



The Pleiades, in Taurus—Naked-eye View.

other being the missing Pleiade. There are many telescopic stars in the group. Mean right ascension 3h. 40m., declination 23° 45′.

Pleiobar. Areas of high barometer, or where the pressure is above 780 millimeters.

Pleiochasium. In Botany, cyme with three or more axes.

Pleiochroism. Variations in color which some crystals show when viewed along different axes; in topaz three distinct colors may be observed when viewed in the direction of the three rectangular axes. See DICHROISM.

Pleiophylly. Production of an unusully large number of leaves at the nodes of stems; also production of more than a usual number of leaflets on a compound leaf.

Pleiotaxy. Production of an unusual or abnormal number of whorls of leaves on a stem or branch.

Pleistocene. Post-tertiary. It implies that the organic molluscan remains belong almost wholly to existing species.

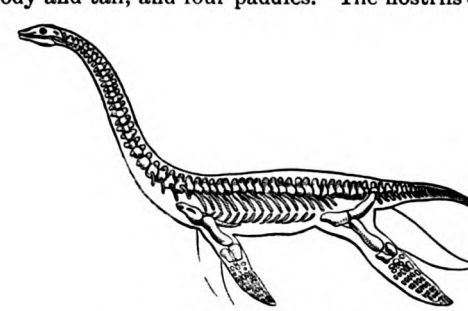
Plenipotentiary. See AMBASSADOR.

Pleonasm. Superfluity of words.

Pleopods. Appendages borne on the abdominal segments of *Crustacea*.

Plerom. Mass of cells at the growing points of plants, from which the woody or fibro-vascular tissues are developed.

Plesiosaurus. Gigantic swimming saurian of the Mesozoic era, with lizard-like head, enormously elongated neck, small body and tail, and four paddles. The nostrils opened far



Plesiosaurus dolichodeirus.

back, and it was capable of taking in a large supply of air. It lived on fish. *P. dolichodeirus*, which attained a length of twelve ft., is the commonest species found.

Plethon, GEORGIOS GEMISTOS, d. ab.1455. Greek deputy to Council of Florence 1439, where he exerted some literary influence, especially for Plato.

Plethora. An over-supply of blood causing an abnormal fullness of the blood-vessels.

Plethospongiæ (FIBROSPONGIÆ or CARNEOSPONGIÆ). Class of Sponges, including the orders *Myxospongiæ*, *Ceratospongiæ*, *Monactinellidæ*, *Tetractinellidæ*, *Lithistidæ*, and *Hexactinellidæ*.

Pleura. 1. Side pieces of the Trilobite's body. 2. Side pieces in the segment of an insect or Crustacean, divided into the epimerum above and the episternum below. 3. Serous sac enveloping the lungs and lining the thorax, enabling the unimpeded movement of the lungs. See SEROUS MEMBRANE.

Pleuracanthus. Fossil Sharks, having fin rays with spines denticulated along both margins; in size and distribution resembling *Ctenacanthus;* probably allied to the modern rays.

Pleurembolic. Proboscis in which during introversion the sides at the base sink in, or fold in first, leaving the apex, on which the mouth is placed, to disappear last. Such a proboscis is always acrecbolic when everted. Examples are probosces of rhabdocœlous Planarians, and the ordinary Whelks, Conchs, and Sea-snails.

Pleurisy. Inflammation of the serous tissue covering the lungs. There is a sharp pain in the side greatly increased in taking a long breath. This is usually preceded by a chill and is always accompanied by fever, wherein it differs from intercostal neuralgia. An active cathartic at the beginning of the attack is usually permissible, and a warm poultice to the affected side gives comfort, but the details of treatment vary with each case.

Pleurisy-Root. See BUTTERFLY-WEED.

Pleurocarpi. Division of Mosses having the sporanges borne laterally on the stem or branches.

Pleurocarpous. Plants which bear their fruit laterally; more usually, in Bryology, mosses whose sporanges are so borne.

Pleurococcaceæ. Order of *Chlorophyceæ* or green *Algæ*, consisting of minute isolated cells, or these aggregated into irregular colonies, propagating only by division.

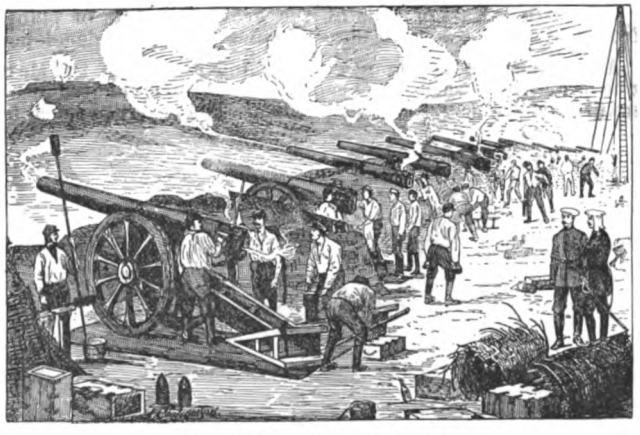
Pleurodont Dentition. In Reptiles, where the teeth are borne on the inner side of the dental ridge, and not in sockets.

Pleuronectidæ. See ANACANTHINI and HETEROSOMATA.

Pleuro-Pneumonia. Combined attack of PLEURISY and PNEUMONIA (q.v.). In most cases of pneumonia, the pleura adjacent to the diseased lung is inflamed, but the word is not used unless the symptoms of pleurisy are very marked in connection with an attack of pneumonia.

Pleurotribe. In Plant Physiology, zygomorphic flowers in which in cross-fertilization the pollen is deposited on the side of the visiting insect.

Plevna. Town of Bulgaria, 24 m. s.s.w. of Nikopolis, defended by Osman Pasha against Russian besiegers Aug.–Dec.



The Giant Battery before Plevna.

1877. After twice repulsing the Russian attacks in July 1877 he intrenched himself and held out until Dec. 10. Pop. ab. 15,000.

Pleyel, IGNAZ JOSEPH, 1757–1831. Musical composer of Austrian birth, author of 29 symphonies and many chamber compositions; in later life publisher and pianoforte maker in Paris. *Pleyel's Hymn* is an arrangement of one of his instrumental melodies, 1791, set to Addison's hymn, *The Spacious Firmament on High.*

Plicate, or PLAITED. Folding of leaves in the bud in the manner of a closed fan, the folds being along the main veins, as in the Maple and other palmately veined leaves; also a manner of æstivation, where the corolla tube is folded in plaits, as in Morning-glories.

Plimsoll, SAMUEL, b. 1824. M.P. 1868–80; author of the Merchant Shipping Act of 1876, revised 1890; active and persistent reformer in this field, who exposed many abuses, and did much to protect and benefit sailors. *Our Seamen*, 1873; *Cattle-Ships*, 1890.

Plinth. Lowest projecting member of a wall, pedestal, or column.

Pliny (GAIUS PLINIUS SECUNDUS), CAIUS, 23–79. Roman naturalist, procurator in Spain ab.68–71; killed while studying an eruption of Vesuvius. *Historia naturalis*, tr. 1601.—His nephew, GAIUS PLINIUS CÆCILIUS SECUNDUS, b. 62, was Consul 100, and Proprætor in Bithynia 103–105. His letter thence to Trajan throws much light on the proceedings against the Christians. His *Epistolæ* were tr. 1746.

Pliocene. Upper Tertiary beds; so called by Lyell.

Pliohippus. See EQUIDÆ.

Plotinus, 205–270. Greek philosopher, founder of Neo-Platonism, which placed the Absolute above all cognizability, and made absorption in the contemplation of it the means of moral purification.

Plots. Conspiracies, usually to overturn a government, often with murder of those in authority. They have been hatched in every monarchial country, and with most excuse under despotisms; but republics have not been exempt. One of the best-remembered, that exposed or invented by Titus Oates 1678, was probably no plot at all.

Plougs, CARL PARMO, 1813–1894. Danish poet; ed. *Fatherland*, 1841–87; legislator 1848–90.

Plovers. Wading shore birds of sub-family *Charadriinæ*, sometimes also known as Sandpipers. Their bills are long for probing in the mud. The wings are long and pointed. The most peculiar species lives in New Zealand: its bill is sharply bent either to the right or left, near the end, enabling it to secure food from beneath stones.

Plow. Fundamental tillage implement. The original plow was a forked stick, and merely served to scratch the surface of the ground. The modern plow has been evolved from this, so that plowing carries with it the idea of both lifting and turning over the soil. That plow is the most efficient which, other things being equal, causes the most complete pulverization of the particles of the soil by their action on each other during this lifting and turning process. See AGRICULTURE.

Plowden, EDMUND, 1519–1584. English law writer. His *Commentaries*, pub. in French 1684 and in English 1792, extend 1550–80, and are highly valued.

Plow Monday. English holiday; Monday after Twelfth Day, Jan. 6, when agricultural laborers were accustomed to

Procession of the Plow on Plow Monday.

draw a plow about, and solicit money, with masks and the sword dance.

Plücker, JULIUS, 1801–1868. Mathematician and physicist. Prof. Bonn 1826–34, and from 1836; best known from his equations on the singularities of curves.

Plücker's Tubes. See GEISLER'S TUBES.

Plug and Feather. Combination of irons and wedges, by means of which, without the aid of powder, large blocks of stone in a quarry are split off along lines determined by a series of small drill holes.

Plukenet, LEONARD, 1642–1706. Physician and botanist in London. *Opera omnia botanica*, 1720.

Plum. Small trees of the genus *Prunus*, natural family *Drupaceæ*, comprising numerous species, natives of the n. temperate zone, many of them cultivated for their fruit.

Plumatella. See PHYLACTOLÆMATA.

Plumbaginaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising ab. 8 genera and 250 species, mostly herbs widely distributed; called the Leadwort family.

Plumbago. See GRAPHITE.

Plumbates. Salts derived from plumbic acid, H_2PbO_3.

Plumbic Compounds. Compounds of lead.

Plumbing. Pipes and connections which bring water to a house and carry it away. Lead was used by the Romans, whence the word. Iron is now more frequently used both for water and drain pipes, screw joints being provided for the former, and lead joints for the latter. All drain pipes should have both traps and vent tubes. Plumbing work should be accessible, and not be surrounded by woodwork or be concealed in closets. The house drain or soil pipe is usually four inches in diameter. See HOUSE DRAINAGE.

Plumbism. See LEAD-POISONING.

Plumbites. Compounds made by treating lead hydroxide with bases, general formula, $Pb(OM)_2$, in which M stands for a univalent metal.

Plumb Line. Device for determining the direction of the vertical at any point of the earth's surface. It consists of a small mass, usually of metal, suspended at the end of a string and allowed to come to rest under the action of its weight only. The direction of the string is then vertical. Local causes, *e.g.*, a mountain on one side, may slightly deflect the plumb line from the true vertical.

Plum Curculio. Snout-beetle, $\frac{1}{8}$ in. long. It winters under rubbish, eats buds, leaves, and fruit. Ab. 100 eggs are laid, each in a hole in the fruit made with the snout, a few being laid each day. When the grub is full grown, the fruit falls, and in a month the transformation into a beetle has occurred. They can be caught on sheets by jarring the tree early in the morning, or at evening. A one per cent solution of Paris green can be used as a spray.

Plum Curculio.

Plumier, CHARLES, 1646–1704. French Franciscan. *Plantes de l'Amerique*, 1693; *Nova plantarum Americanarum genera*, 1703; *Filicetum Americanum*, 1703; *Plantarum Americanum fasciculus*, 1755–60.

Plum Knot. *Plowrightia morbosa.* Parasitic fungus found upon twigs of plums and cherries.

Plumose. In Botany and Zoölogy, feather-like structures.

Plum Pockets. Parasitic disease of plums in which they are swollen and hollow, produced by *Exoascus pruni*, a fungus which punctures the tissue and finally produces spore sacs.

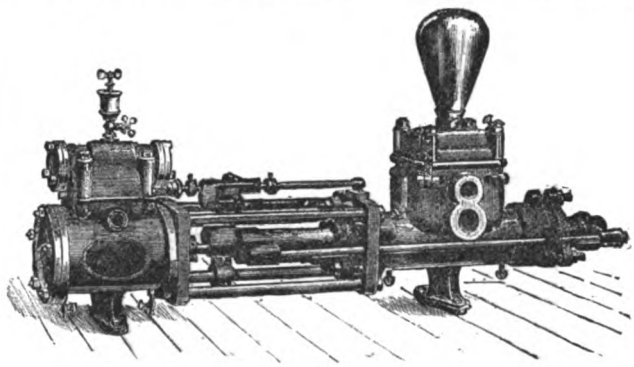
Plumptre, EDWARD HAYES, D.D., 1821–1891. Dean of Wells 1881; O.T. reviser; poet: tr. Sophocles, 1865, Æschylus, 1868, and Dante, 1887. *Life of Bp. Ken*, 1888.

Plum Pudding. Old English dish, consisting of raisins, currants, beef suet, bread-crumbs, flour, sugar, eggs, milk, and brandy. It is boiled or baked and served with sweet sauce.

Plumularidæ. Family of campanularian *Hydromedusæ*, having the hydrothecæ in a single row on the branches. Those of the nutritive polyps have small accessory calyces filled with nettle-cells (nematocalyces).

Plumule. Initial terminal bud of a vegetable embryo or germinating seed.

Plunger. (See PISTON.) Cylinder of relatively large diameter, which slides through a stuffing-box into a larger cylinder whose bore it does not touch, and which acts to force liquid out of the latter by displacement. It will be seen to be single-acting in this form, and to be a better forcing arrangement than adapted for a lifting or sucking pump. The plunger is cheaper to turn than a cylinder is to bore with its fitting



Outside Packed Plunger Pump.

piston, and for gritty liquids the wear is less rapid. To make a plunger system double-acting, it must either be doubled in two chambers, entering and withdrawing alternately, or one plunger fitting a diaphragm between the chambers must be operated by a rod through the wall of one, the length of the plunger being enough greater than the stroke to secure its fit in the diaphragm.

Plunket, WILLIAM CONYNGHAM, LORD, 1765–1854. Irish lawyer, M.P. 1807–22; Baron and Chief-justice 1827; Lord Chancellor of Ireland 1830–41.

Pluralism. Holding two or more posts, especially in the Ch., together; forbidden by sundry councils from 451; long practiced in Ch. of England, but made impossible by recent statutes.

Plus. Sign of addition (+). It denotes positive as opposed to negative. It is a sign both of operation and of character. As quantities are usually assumed to be positive unless otherwise stated, the plus sign is generally omitted before monomials and the first term of any expression.

Plush. Variety of cloth woven like velvet but having a longer pile.

Plutarch, ab.46–ab.120. Greek author, known by his *Lives* of 46 of the great men of antiquity, which are familiar in every civilized land, and his estimable *Morals*, tr. ab.1680. He represents the best elements in the thought and life of his time.

Pluteus. Bilateral larva of the Sea Urchins and Ophiurans. It has three or four pairs of long, slender, diverging arms, stiffened by calcareous rods. The adult develops inside this larva by a process analogous to the metamorphosis of insects.

Pluto. HADES (q.v.); god of the under world, and supposed giver of wealth.

Plutology. Science of wealth; name proposed by Prof. Hearn for the science of political economy.

Plutonic Rocks. Granite, porphyry, and other igneous rocks; supposed to have consolidated from a melted state at a great depth from the surface.

Plutonism. Hypothesis of the formation of the earth's crust which, attributing many of the rocks to igneous action, divided the opinion of geologists ab.1800. Advocated by Hutton and Playfair, and zealously and courageously defended by their followers against the attacks of the Neptunists, it has gradually grown in favor and become an established principle in Geology.

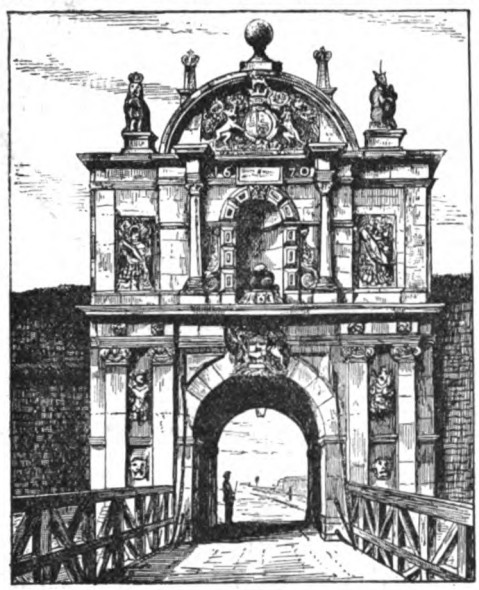
Plutus. God of wealth, struck blind by Jupiter, that he might distribute his gifts without regard to merit.

Pluviometer. See RAIN GAUGE.

Plymouth. Capital of P. co., Mass.; famous as the land-

ing-place of the Pilgrim Fathers Dec. 21, 1620. The rock on which they landed is covered with a granite canopy; a monument to their memory was dedicated 1889. Pop., 1890, 7,314.

Plymouth. Seaport and borough of Devonshire, at the head of P. Sound; prominent in the naval history of England. It is a very important naval station, has manufactures, and a



Citadel Gate.

large commerce. The citadel, at the eastern extremity of the Hoe, is a fine example of the fortifications built during the latter half of the 17th century. Pop., 1891, 87,307.

Plymouth Brethren. Denomination organized in Dublin 1827; premillennian and anti-ecclesiastical. Their leader was J. N. Darby, 1800–1882.

Plymouth Sound. Inlet of the English Channel on s.w. coast of England, ab. 3 m. long and 4 m. wide.

Plympton, GEORGE WASHINGTON, b. 1827. Prof. Brooklyn Polytechnic Institute 1863; Cooper Union 1869; ed. *Van Nostrand's Magazine*, 1870–86. *The Blowpipe*, 1870; *The Aneroid*, 1880.

Pneumatic Caisson. See CAISSON.

Pneumatic Dispatch. Method of transmitting papers or merchandise through tubes by compressed air, first suggested by Denis Papin 1687. In 1853 a London telegraph station and the Stock Exchange were connected by a tube 1½ in. diameter, 660 ft. long, round boxes being carried by a partial vacuum. In 1858 compressed air was used in one direction and a partial vacuum in the other. The London Post-office uses a lead pipe 2½ in. diameter, inclosed in an iron pipe, with an air pressure of 10 lbs. and a vacuum of 6½ lbs., attaining a speed of 1,000 yds. a minute and 3,000 yds. in 5½ minutes. A parcel dispatch from a railroad station to the post-office in London was established 1863, a tube 2 ft. 8 in. square, 1,800 ft. long, with wheeled carriages moving at the rate of 17 m. per hour being used. In 1872 two tubes 4 ft. by 4 ft. 6 in., 14,214 ft. long, were laid there for the same purpose to the General Post-office. In Philadelphia, 1893, the Post-office Department laid an iron pipe 6 in. diameter, ab. 3,000 ft. long; both pressure and vacuum are used. The pipes connecting the New York and Brooklyn post-offices will be 8 in. diameter, and those connecting with the sub-offices will be 8 in. and 10 in. The Western Union Telegraph Co. have had their offices connected by pneumatic dispatch tubes for many years, and in many mercantile establishments the cashier's office is connected with the salesrooms in the same manner.

Pneumatic Duct. See DUCTUS PNEUMATICUS.

Pneumatic Dynamite Gun. Long barreled cast-iron gun, whose projectiles are loaded with dynamite or explosive gelatin and are fired by pneumatic pressures, not exceeding 1,500 lbs. per sq. in. The necessary accessories are boilers and compressors for compressing the air, reservoirs for storing it, and electric motors for elevating and traversing the gun. D. M. Mefford of Ohio first applied this principle to a 2-in., 28-ft. gun 1883, and Capt. E. L. Zalinski, U.S.A., demonstrated in 1884 with an 8-in. gun the feasibility of throwing dynamite loaded shells with safety and accuracy to a distance of over two miles. U. S. Government recently established two batteries of these guns; one of one 8-in. and two 15-in. guns at Sandy Hook, N. Y. Harbor, and one of three 15-in. at Fort Winfield Scott, San Francisco Harbor. The 15-in. guns at Sandy Hook command the main channel for a course of 9,000 yds. and the Swash Channel for 4,200 yds., and would have a vessel, going at 20 miles an hour, under fire for 16 and 7½ min. respectively. Each gun could deliver 10 projectiles in the first case and 5 in the second. The 15-in. guns, firing charges of from 200 to 500 lbs. of explosive gelatin with great range and accuracy, ought really to be considered torpedo throwers, and as such have a distinct value in coast defense works much beyond others of this class.

Pneumatic Pile. Hollow cylinder which is sunk by the help of compressed air, and afterward is filled with concrete and serves as a support for a superstructure. Depths of 60 ft. may be reached by this method in soft soil.

Pneumatic Power. Compressed air in pipes for a pneumatic clock system was introduced into Paris 1870, and subsequently extended to supply motors, a pressure of 90 lbs. per sq. in. being maintained in 30 m. of pipe. In 1889 a similar system was established in Birmingham, Eng. Compressed air for propelling tram-cars has been used in France since 1879. There is a line from Vincennes 12 m. long, the air, under pressure of 600 lbs. per sq. in., being carried in steel tanks beneath the car. In New York city compressed air of 2,500 lbs. pressure is similarly employed on street cars.

Pneumatic Railway. One on which the cars are propelled by compressed air. In 1870 a line one block in length was built by Alfred Beach under Broadway, New York, the diameter of the tunnel being 8 ft. In 1865 a railroad 600 yds. long was laid in a brick tunnel 10 ft. by 9 ft. at Sydenham, Eng., and the car was propelled this distance in 50 seconds with an air pressure of 2½ oz. per sq. in.; compressed and rarefied air were used alternately.

Pneumatics. That subdivision of MECHANICS (q.v.) which treats of the action of forces upon air and other gases, discussing their weight, friction, efflux, etc.

Pneumatic Syringe. See FIRE SYRINGE.

Pneumatic Trough. Water tank, devised by Priestley, over which gases are collected in bell-jars.

Pneumatocyst. Air-chamber in a pneumatophore.

Pneumatodes. Upright processes growing from the roots of palms and some other trees and shrubs; supposed to be organs of aëration.

Pneumatophore. Modified polyp of a Siphonophore colony which buoys up or floats the hydrosoma.

Pneumochlamyda (OPERCULATA). Section of *Reptantia*, including the *Aciculidæ* and *Cyclostomidæ*, sometimes classed with the Pulmonates.

Pneumodermon. See GYMNOSOMATA.

Pneumo-Gastric Nerve. Tenth cranial nerve of the anatomist, emerging from the base of the brain. It supplies the organs of the voice and of the respiration with both motor and sensory nervous energy; and the heart and stomach with motor nerves alone. Its relation to respiratory, circulatory, and digestive functions makes it one of the most important nerves of the body.

Pneumonia. Inflammation of the lungs. Physicians distinguish a number of forms, one of which, the croupous or lobar, is understood when the name is used alone. The disease is now believed to be caused by one of several micro-organisms, the pneumococcus of Frænkel being the most common. Some abnormal condition of the lung is necessary as another factor, hence the disease occurs more frequently in cold weather. There is a chill, followed by a high fever, rapid respiration and pain on the affected side. Like all diseases of similar causation it is self-limited, but is frequently fatal. Domestic remedies are not to be relied upon, but anything that will assist to relieve the congested lungs, as hot foot-baths or warm poultices to the chest will be helpful till the doctor comes.

Pneumonophora. See DIPNEUMONA and APODA.

Pnyx. Place of meeting for the popular assembly in Athens. Its exact location is not known.

Po. River of n. Italy, heading in the Alps and flowing e. into the head of the Adriatic Sea. Length 360 m., drainage area 28,730 sq. m. The volume of its water is great but variable, necessitating levees along much of its course.

Poaching. Unlawful destruction of game or fish; also,

trespassing on another person's land or water in pursuit of game or fish.

Pocahontas, ab.1595–1617. Daughter of the Indian Chief Powhatan; protector of Capt. John Smith when about to be

Pocahontas.

executed; married to John Rolfe 1614; she left one son; ancestress of several Va. families.

Pocket. In Mining, small local accumulation of rich ore.

Pocock, EDWARD, D.D., 1604–1691. English Orientalist; chaplain at Aleppo 1630–36, where he mastered Arabic; prof. of Arabic at Oxford 1636, and of Hebrew 1648. He rendered distinguished service in Biblical studies. *Works*, 1740.

Pococke, RICHARD, LL.D., 1704–1765. Traveler in Asia and Egypt; Archdeacon of Dublin 1745; Bp. of Ossory 1756, and of Meath 1765. *Description of the East*, 1743–45.

Pocomoke River. River rising in the Cypress Swamp of Delaware, flowing s.w. into Chesapeake Bay; 70 m. long; navigable for sloops 35 m.

Pocono. Thick Pa. sandstone, lying below the Pottsville. See CARBONIFEROUS.

Pod. Seed-vessel which opens to emit the seeds; said to be dehiscent.

Podactinaria. See LUCERNARIÆ.

Podaxonia. Phylum of *Metazoa*, including the classes *Sipunculoidea*, *Brachiopoda*, and *Polyzoa*.

Podesta. Mediæval magistrate in n. Italian towns, often practically a dictator.

Podesti, FRANCESCO, 1801–1895. Italian historical painter and sculptor. *Siege of Ancona by Barbarossa; Francesca di Rimini; Judgment of Solomon.*

Podetium. Stalk supporting the apothecium in lichens; also that of the sporanges in some hepaticæ.

Podiebrad, GEORGE, 1420–1471. Hussite leader; Regent of Bohemia 1453, King 1458; wise ruler who aimed to reconcile factions; excommunicated 1466; attacked by M. Corvinus of Hungary, whom he overcame.

Podocarpous. Fruit supported on a stalk above the calyx.

Podogynium. See GYNOPHORE.

Podolia. Region of w. Russia, on the Austrian border. Area 16,224 sq. m.

Podophthalma. See RHIPIDOGLOSSA.

Podophthalmata (PODOPHTHALMIA). Stalk-eyed *Crustacea;* division of *Malacostraca*, including the *Thoracostraca;* in a restricted sense only the Stomatopods and Decapods.

Podophthalmite. Outer (distal) joint of the ophthalmite.

Podosomata. Group of Arachnids, including the Pycnogonids.

Podosperm. See FUNICULES.

Podostemaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 23 genera and ab. 116 species, growing usually on sunken rocks in swiftly flowing streams in tropical and temperate regions; called the River-weed family.

Poduridæ. See THYSANURA.

Poe, EDGAR ALLAN, 1809–1849. Poet, romancer, and critic, esteemed in France and Germany, if not also in England, the chief figure in American literature. His genius was striking, erratic, and lurid; his misfortunes were chiefly due to the fatal deficiencies of his character. With rare gifts of fascination, he had no love for truth, small sense of responsibility, smaller power of self-direction; hence his life was spent in shifts, in hack-work, in vain projects, and often in bitter misery. His early volumes of verse appeared 1827–29–31; *Narrative of Arthur Gordon Pym*, 1838; *Tales of the Grotesque and Arabesque*, 1840; *Tales*, 1845; *The Raven*, etc., 1845; *Eureka*, 1848. His critical work was that of a pioneer, and is now unimportant; but his best poems, *The Raven* and *The Bells*, will live. His

Edgar Allan Poe.

wonderful tales, ranging from pure genius almost to pure insanity, occupy a unique position. His works were collected in 4 vols. 1850, and more completely in 10 vols. 1895. The only reliable life of him is by G. E. Woodbury, 1885.

Poe, ORLANDO METCALFE, U.S.A., 1832–1895. Brig.-gen. U. S. Vols. 1862; chief engineer under Gen. Sherman. He did much work on rivers, harbors, and lighthouses.

Poëbrotherium. Generalized type of American Miocene animals, from which, through the Pliocene *Procamelus*, Cope traces the descent of the modern Camel.

Pœcilopoda (XIPHOSURA). Group of *Gigantostraca*, including *Limulus* (King-Crabs). They have a broad horse-shoe-shaped cephalothorax, an abdomen with five pairs of leaf-like appendages, and a long movable caudal spine (telson). The six pairs of thoracic appendages are chelate and surround the mouth, which is centrally located, on the ventral side.

Pœphaga, or MACROPODA. Tribe of diprotodont Marsupials, including the *Halmaturidæ* or KANGAROOS (q.v.). *Macropus* is the Great Kangaroo.

Poeppig, EDUARD, 1797–1868. Prof. Leipzig from 1833; writer on the Fauna and Flora of S. America 1835–45, and on the U. S. 1837.

Poerio, ALESSANDRO, 1802–1848. Italian patriot and lyric poet, killed in battle with the Austrians. Some of his songs were notable contributions to the cause.—His brother, CARLO, 1803–1867, endured repeated imprisonment at Naples, was deported 1858, and was a member of the parliaments of 1848 and 1860.

Poet Laureate. See LAUREATE, POET.

Poetry. Literature of imaginative character, usually in metrical shape. It has existed from the earliest ages, commonly in some form of rhythm, and was often handed down orally. It constitutes an important part of every modern literature, generally (except in the case of blank verse) in rhyme and under recognized metrical laws. Its main divisions are dramatic, epic, and lyric. If we look beyond externals, the essence of poetry is often found in prose compositions, while much verse is no more than "prose tagged with rhyme."

Poey, FELIPE, 1799–1894. Prof. Havana from 1842, the work of his chairs including zoölogy, botany, mineralogy, geology, and philosophy. *Natural History of Cuba*, 1851–60. His *Synopsis Piscicum Cubensium*, 1868–75, was purchased by the Spanish Government, and won praise in Europe.—His son, ANDRÉS, b. 1826, is noted chiefly as a meteorologist.

Poggendorf, JOHANN CHRISTIAN, 1796–1877. Prof. of Physics at Berlin from 1834; ed. *Annalen der Physik und Chimie* from 1824; inventor of a multiplying galvanometer; writer on electricity and on the history and biography of science.

Poggio Bracciolini, GIAN FRANCESCO, 1380–1459. Italian historian, essayist, and satirist; secretary to Papal Court 1403–53; collector of classical MSS. *Liber Facetiarum.*

Pogodin, MIKHAIL PETROVICH, 1800–1875. Russian historian, translator, and journalist; prof. Moscow 1830–44.

Pogonias. See ACANTHOPTERI and DRUMFISH.

Poh. In Africa, Arab game of MANCALA (q.v.). The word is mimetic, imitating the sound of a piece thrown upon the resonant board.

Pohl, JOHANN EMMANUEL, 1784–1834. Austrian botanist, in Brazil 1817–21; writer on its plants 1827–32.

Poikilothermic. Cold-blooded, *i.e.*, having blood that varies in temperature with that of the external medium.

Poindexter, GEORGE, 1779–1853. M.C. from Miss. 1807–13; U. S. District Judge 1813–21; reviser of Miss. laws; U. S. Senator 1830–35; violent anti-federalist.

Poinsett, JOEL ROBERTS, LL.D., 1779–1851. M.C. from S. C. 1821–25; U. S. Minister to Mexico 1825–29; Sec. of War 1837–41.

Point. Position considered without magnitude. Points moving under different laws may become coincident, yet each may have under its law a different tendency.

Point Alphabet. This consists of raised dots, variously grouped to represent letters and words, for the blind. New York alphabet and the Braille are used in U. S., the latter in Europe.

Pointed Arch. One whose intrados is formed by two arcs of circles intersecting at the crown; Gothic arch.

Pointed Architecture. See GOTHIC.

Pointed Boxes. Rittinger hopper; piece of apparatus used in ore-dressing.

Pointer. Kind of dog closely related to the hound; introduced into England from Spain 1750 and crossed with the foxhound to produce the English variety. The pointer is very affectionate and intelligent. The habit of pointing the posi-

Pointer Standing at Game.

tion of the game when scented was first taught, but is now hereditary, as young pointers exhibit it. When scenting game the pointer stops so suddenly that the forefoot remains suspended in the air, when already lifted.

Points (NAUTICAL). Plaited ropes attached to the sails for the purpose of reefing.

Points of the Compass. See COMPASS.

Poiret, JEAN LOUIS MARIE, 1755–1834. French botanist. *Lecons de Flore*, 1819–20; *Histoire des plants de l'Europe*, 1825–29.

Poiret, PIERRE, 1646–1719. French mystic, resident in Germany; editor of Mme. Guyon and Mlle. Bourignon. *Divine Economy*, 1687, tr. 1713.

Poiseuille, JEAN LOUIS MARIE, 1799–1869. French physician and medical writer.

Poiseuille's Law. Law of liquid flow through very small tubes, investigated by Poiseuille. It is given briefly by the equation, $V = \frac{Kr^4H}{l}$, in which V is the volume of liquid flowing in one second through a tube of radius r and length l under a head H, and K is a coefficient depending on the liquid used and on the temperature.

Poison. Substance that uniformly works hurt to an organism, even in a state of health, but not by mechanical action. Poisons are found in the Animal (venom of snakes), Vegetable (strychnine), and Mineral (arsenic) kingdoms. In many instances, when administered in small doses, substances classed as poisonous exert a beneficial action on certain diseased conditions.—Poisons may be classified as follows: Irritant poisons irritate and inflame the tissues, inducing vomiting, purging, and pains in the stomach and intestines: *e.g.*, arsenious acid. Corrosives have a burning taste, attack and perforate the tissues, and also have same effects as the irritants; *e.g.*, hydrochloric acid and caustic potash. Neurotics affect the nerves, brain, spinal marrow, and heart; there are four classes. Cerebral poisons affect the brain, producing insensibility and coma; *e.g.*, morphine. Spinal poisons affect the spinal marrow, producing great sensibility and convulsions, no stupor, but conscious till death; *e.g.*, strychnine. Cerebro-spinal affect the brain and spinal marrow and indirectly the heart, producing the combined symptoms of the two preceding classes; *e.g.*, aconitina. Cerebro-cardiac act upon the brain and heart, sometimes on the spinal marrow, reducing pulsations of the heart, paralyzing it, and also may affect the brain and spinal marrow; *e.g.*, nicotine.

Poison Ivy. See IVY, POISON.

Poison of Serpents. See SERPENTS, POISON OF.

Poisonous Snakes. See PROTEROGLYPHA, SOLENOGLYPHA, and BITES.

Poisons, ANTIDOTES FOR. Vomiting should be promoted by mustard and water or zinc sulphate and water. For acids powdered magnesia, chalk or carbonate of soda in tepid water should be given, followed by milk. For alkalies dilute vinegar or lemon juice is efficient. The antidote for corrosive sublimate is white of egg; for arsenious oxide, magnesia and iron peroxide in water; for tartar emetic, tannic acid from gall nut or bark; for acetate of lead, magnesium sulphate; for opium, cold applications to the chest, electric stimulation, decoction of coffee, atropine subcutaneously, and exercise.

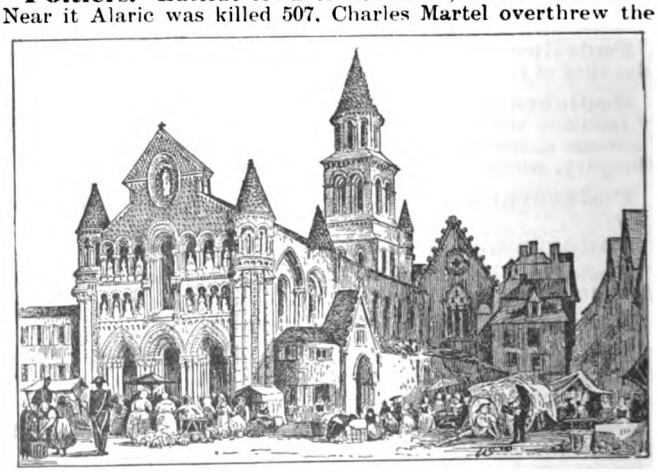
Poisson, SIMÉON DENIS, 1781–1840. Mathematician and physicist; lecturer at the Paris Polytechnic 1802. *Mechanics*, 1811–32; *Theory of Probabilities*, 1838.

Poisson's Equation. $V^2V = D_x^2V + D_y^2V + D_z^2V = -4\pi\varsigma$. It asserts that the potential function V, due to any distribution of matter, must be such that at all points within the mass the value of V satisfies the above equation, ς being the density at the point considered.

Poisson's Ratio. Ratio of proportional contraction to extension when a prism or wire is stretched longitudinally. It has been contended on the continent of Europe that this ratio should be $\frac{1}{4}$ for all isotropic solids. Stokes has however shown that for India rubber this ought to be nearer $\frac{1}{2}$ than $\frac{1}{4}$, and Thomson and Tait have shown that for cork it is much less than $\frac{1}{4}$; so that isotropic bodies present no agreement in their value for Poisson's ratio.

Poissy, COLLOQUY OF. Sept. 1561, between French prelates and 12 Huguenots led by Beza. It was followed by other conferences, and in Jan. 1562 by an edict of partial toleration.

Poitiers. Ancient town of w. France, 61 m. s. of Tours. Near it Alaric was killed 507. Charles Martel overthrew the



Cathedral of Notre Dame, Poitiers.

Saracens 732, and Edward the Black Prince with ab. 12,000 men defeated King John with 60,000, Sept. 19, 1356. Pop., 1891, 37,497.

Poitiers, DIANE DE, 1499–1566. Mistress of Henry II. of France 1547–59; Duchess of Valentinois 1548; all-powerful for a time.

Poitou. Former province of w. France, held by England 1152–1204, and several times later.

Poke, INDIAN. See HELLEBORE, FALSE.

Poker. Derived from the old card game of Primero or Prime, which was a favorite game in England ab.1500. In the 17th century a game called Post and Pair, derived from Primero, was played in w. England; from this came the game of Brag, of which the American game is simply a variation. It evidently arose in the custom of betting on the hands dealt in a round game, which itself was finally abandoned. The same process is now going on in Japan, where gamblers frequently do not play out the complicated native game of cards called 88, but win or lose according to their bets on the hands dealt. Straight Poker or Bluff originated in s.w. U. S. early in this century and was played with 20 cards, later with a full pack, the game depending on the five cards dealt. Draw Poker came later, the players having the privilege of drawing other cards in place of those dealt. Rank of the hands from the lowest upward: Pair; Two Pairs; Triplet; Straight, sequence of five not of same suit, not always played; Flush, five cards of same suit; Full, triplet and pair; Four of a kind; Straight Flush, sequence of five of same suit.

Poker Drawings. Designs burned upon wood with hot pokers. John Cranch, 1751–1823, was noted in this line. Two poker drawings by Salvator Rosa are said to be at Knowsley Hall, Eng.

Pokeweed. *Phytolacca decandra.* Coarse American weed of the natural family *Phytolaccaceæ*, the berries yielding a crimson fluid; known as Scoke, Garget, and Pigeon-berry.

Pola. Ancient town of Istria, on the Adriatic, 54 m. s. of Trieste; held by Venice 1148–1797; repeatedly destroyed; chief naval station of Austria since 1848. It has a fine harbor, which has been used in all ages. Pop., 1890, 39,273.

Polabians. Ancient Slavic race occupying the Lower Elbe. In a wider sense, used to designate all Slavonic peoples w. and n.w. of the Oder and Erzgebirge.

Poland. Formerly one of the largest and most powerful kingdoms in Europe, defender of Christendom against the Turks; named from the Polani, a Slavic tribe. Its history begins with Ziemovicz, second monarch of Piast dynasty, ab.850. Misceslas I., 962–992, accepted Christianity. Boleslas I., 992–1025, enlarged the territory, and introduced beneficent institutions. An invasion of Mongols took place 1241. The first Diet assembled 1331. The Piast dynasty expired with Casimir III., 1333–1370. Lewis of Hungary succeeded; the Jagellon dynasty was founded by his son-in-law, who united Lithuania to P. 1386. Before 1500 P. extended from the Baltic to the Black Sea, including much of Prussia and Russia. The highest prosperity

Poles of Volhynia.

was attained under Sigismund I. and II., 1506–72, the last of the Jagellons. Two elements of weakness were now added to the Constitution, the *liberum veto*, by which one member of the Diet could stop legislation, and the law making the monarchy elective. Stephen Batory, 1575–86, warred successfully with Russia. Under the weak Swedish rulers, 1586–1672, Polish armies were still victorious for a time, but later P. was overrun by enemies, and its territory was greatly reduced. War with Turkey followed, and, after a disgraceful peace, was renewed under Sobieski, who routed the Turks at Choczim 1673. The luxurious court of Augustus II. of Saxony, 1697–1733, had a corrupting influence; his war with Charles XII. led to dependence on Russia. Under Augustus III. it was attempted, too late, to make the monarchy hereditary. In 1763 Russia and Prussia presented S. Poniatowski to the Poles as their king. The insult was resented, but Russia fomented discord, forcing her protection on the Conservative party. The Confederation of Bar declared war against Russia 1768. In 1772 Russia and Austria divided among them 82,000 sq. m. of Polish territory. The second partition followed a vain attempt at resistance, under J. A. Poniatowski and Kosciusko 1793; the third, 1795, after a general rising of the Poles, ending in the capture of Warsaw, and the overthrow of the monarchy. Napoleon established the Duchy of Warsaw 1807, which was overthrown 1813. Repeated rebellions, especially in the portion subject to Russia, have only brought further calamity upon the Poles. A rearrangement of the division of P. was made by the Congress of Vienna 1815. See WLADISLAS.

Poland, LUKE POTTER, 1815–1887. Judge of Vt. Supreme Court 1848–60; Chief-justice 1860–65; U. S. Senator 1865–67; M.C. 1867–75 and 1883–85.

Poland China. See SWINE.

Polar Bands. Forms of cirrus clouds that are arranged in apparently converging but really parallel lines, stretching across the sky.

Polar Bodies. See POLAR GLOBULES.

Polar Cells. See POLAR GLOBULES.

Polar Clock. The plane of polarization of sky light is always 90° from the sun, and Wheatstone designed a clock dependent upon this which gives apparent solar time within a few minutes.

Polar Current. Currents of air that flow from the polar side toward the equatorial side of any locality, as the n.e. winds of Europe.

Polar Distance OF A STAR. In the n. hemisphere, distance from the North Pole of the heavens, measured on a great circle of the celestial sphere.

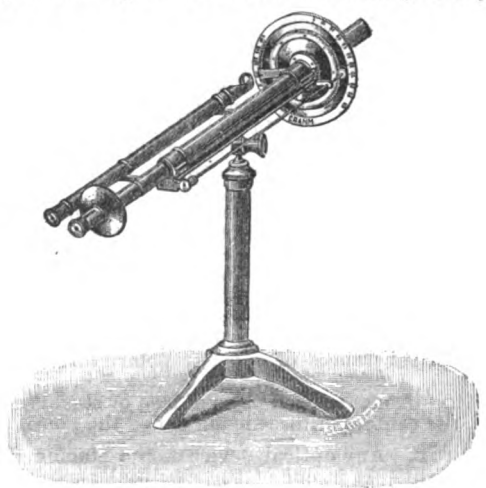
Polar Exploration. See ARCTIC OCEAN, ANTARCTIC OCEAN, NORDENSKIOLD and PEARY.

Polar Globules. When an egg is ready to receive the spermatozoön or ready to develop into a new organism, the nucleus (germinal vesicle) divides, and one-half passes out at the animal pole, with a little of the yolk; this is the first polar globule. In parthenogenetic eggs, the nucleus, left in the egg, multiplies to form the cells of the embryo. In other eggs, which need to be fertilized by a spermatozoön, the polar globule first extruded may divide again, but the nucleus left in the egg always does so, and one-half is passed out as the second polar globule. What is left in the yolk is the female-pronucleus, which unites with the spermatozoön or male-pronucleus to form the segmentation nucleus of the egg, which, by multiplication, produces the cells of the embryo. Weissmann believes that several sorts of protoplasm are present while the egg is acquiring yolk, and what is no longer needed is passed out in the first globule, while the second is the equivalent of the spermatozoön. See SEX and PERIGENESIS.

Polarimeter. See POLARISCOPE.

Polaris. Star α-Ursæ Minoris; second magnitude star, distant from the n. celestial pole 1° 17′.

Polariscope. Optical instrument for producing and analyzing polarized light. It consists essentially of a polarizer



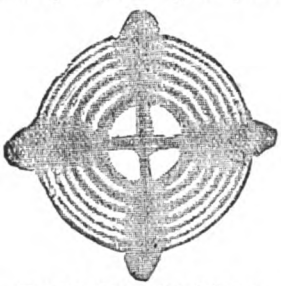
Polariscope.

and an analyzer. In Malus' polariscope both are bundles of thin glass plates, one placed above the other, and both rotating about the same horizontal axis. The upper set of plates is

the analyzer: it may be turned around a vertical axis as well, the angle being read off on a horizontal circle. If the instrument be used for quantitative work, it may be called a polarimeter. See SACCHARIMETER.

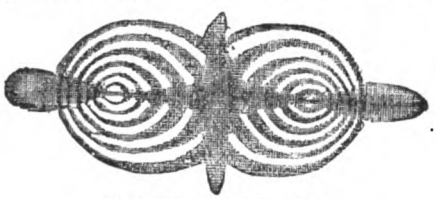
Polarity. Phenomenon exhibited by some plants of placing their leaves in a n. and s. direction.

Polarization, OPTICAL. If the ether vibrations when transmitting a beam of radiant energy be brought into a single plane, the beam is said to be plane polarized. If a wave be propagated by the successive motions of a row of ether particles while each particle moves in a circle, the beam is said to be circularly polarized; again, if the path of each particle be an ellipse, we have elliptical polarization. Polarization may be DEXTROGYRATE or LÆVOGYRATE (q.v.). Light may be polarized; first, by reflecting it from glass or other reflecting surface, the polarization being greatest at a particular angle of incidence called the polarizing angle, which for glass is ab. 53°. The plane of reflection in which polarization takes place is called the plane of polarization. Second, by transmission through a pile of glass plates, the angle of incidence being the



Uniaxal Crystal; Black Cross.

Uniaxal Crystal; White Cross.



Biaxal Crystal; Black Cross.

Biaxal Crystal; Black Cross changed to hyperbolas by rotating the crystal.

Effect produced by passing polarized light through crystals.

polarizing angle. Third, by double refraction, the two rays being polarized in planes at right angles to each other. In the case of tourmaline one of the rays, the ordinary, is absorbed by the crystal so that the extraordinary ray alone emerges. Certain transparent media have the power of rotating the plane of polarization of a beam of light through a definite angle when the beam is passed through them. This phenomenon is called rotatory polarization. The amount of rotation varies with the wave length, and is also proportional to the thickness of the medium traversed. If this thickness be one millimeter, then the angle of rotation for any particular color is called the specific rotatory power of the medium. It may be DEXTROROTATORY or LÆVOROTATORY (q.v.).

ELECTRICAL.—If two conducting plates be immersed in an electrolyte, and a current of electricity be passed through for a short time, the plates suffer a change in condition, in virtue of which, if they now be joined by a wire, a current opposite in direction to the original current will flow through the wire. The electrodes in such a case are said to be polarized. This effect is due to the deposition upon the plates or in contact with them of substances of opposite polarity set free by the current.

MAGNETIC.—A magnetized piece of iron or steel is said to be polarized, the centers of force being called the poles.

Polarizer. Any optical device for producing the polarization of light. It is one of the essential parts of a polariscope. The instruments usually used as polarizers are a plane black glass mirror, a bundle of thin glass plates, or doubly refracting crystal. See NICOL'S PRISM and TOURMALINE.

Polarizing Angle. See POLARIZATION.

Polar Lights. See AURORA BOREALIS.

Polder. Land below the sea-level, which by drainage and dikes has been reclaimed and put to use; important in the Netherlands, where much of the country is of this nature.

Pole. Point near the end of a magnet at which the magnetic force is greatest. See MAGNETISM.

Pole, REGINALD, 1500–1558. Cardinal 1536; papal legate to England 1554; Abp. of Canterbury 1556. He had declined the see of York 1531, and been attainted 1536 for a book against his cousin, Henry VIII.

Pole, SPHERICAL. The pole of any circle or circular arc on the surface of a sphere or spheroid is the extremity of a diameter of the sphere perpendicular to the plane of the circle.

Pole, WILLIAM, Mus.Doc., F.R.S., F.R.S.E., b. 1814. English engineer, musician and authority on whist. *Treatise on Iron*, 1872; *Life of Sir William Fairbairn, Bart.*, 1877; *Life of Sir William Siemens*, 1888; *Philosophy of Music*, 1879; *Philosophy of Whist*, 1883.

Pole-Cat. See FERRET.

Polemics. Religious controversy; department of theology long and earnestly cultivated by differing Christian churches, sects, and schools of thought.

Polemon, 2d cent. B.C. Greek maker of itineraries, probably useful to Pausanius.

Polemoniaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 10 genera and ab. 200 species of herbs, mostly natives of America; called the Polemonium family.

Polenta. Paste, usually of corn meal, eaten in Italy with salt, cheese, and sometimes meat.

Pole of Reference. In Polar Coördinates, fixed point on the initial line about which the radius vector revolves. It is thus the vertex of the vectorial angle.

Pole Piece. Piece of soft iron attached to the pole of a magnet, of such size and shape as to concentrate or arrange the lines of magnetic force to the best advantage. The pole pieces of a dynamo usually take the shape of the armature which is to rotate between them. Iron is used because of its high magnetic susceptibility.

Poles AND **Polars.** Points and lines in the plane of a conic, having certain reciprocal relations. The polar of any point in reference to a given conic is a straight line, the locus of the intersections of pairs of tangents to the conic at points where transversals from the given point cut the conic. The given point is the pole. If the pole be without the conic, the polar is the chord of contact of tangents from the pole to the curve. If the pole be on the conic, the polar is the tangent to the curve at the pole. If two points be so located that the second is on the polar of the first, the first will be on the polar of the second. Every point in the plane of a conic has its polar in reference to that conic; and every straight line its pole. The conic to which any system of poles and polars refers is the auxiliary conic.

Poles, CELESTIAL. Points about which the celestial sphere appears to revolve.

Poles OF THE ECLIPTIC. Points where the line drawn perpendicular to the ecliptic pierces the celestial sphere. Position of North Pole, right ascension 18 h., declination 66° 33′.

Pole-Star. See POLARIS.

Polevoi, NIKOLAI ALEXOCIEVICH, 1796–1846. Russian critic, dramatist, and historian, b. in Siberia; ed. *Moscow Telegraph* 1825–35.—His son, PETER, is also an author.

Polian Vesicles. Little sacs connected with the circumœsophageal water ring of Starfishes and Sea Urchins.

Police. The means used for the preservation of domestic order, and civil regulation of inhabitants to enforce peace and quiet, and promote the public health and security. The policemen are employed by towns and cities, under the direction of a police committee or board. Constables are sometimes appointed by the county courts, and in Pa. Coal and Iron Police are appointed by the Governor upon request for service in the corresponding districts. In most European countries the police are a military organization; in Great Britain the Irish Constabulary only are military in character. London has about 16,000 men in the police force; St. Petersburg 10,000, Paris 8,000, and New York 4,000.

Police, MILITARY. Enlisted men of a company are divided into squads, under the charge of a non-commissioned officer, who is held accountable for the cleanliness or police of quarters, barracks, bedding, bunks, arms, and accouterments. Provost guard is also a military police which, under the orders of a provost-marshal, perform police duty within the limits where military authority prevails.

Police Power. Inherent and plenary power in the State, which enables it to prohibit all things hurtful to the comfort and welfare of society.

Policy. Kind of lottery, introduced from Italy into the U. S., and extensively played by the lower classes in all the large cities. Numbered lots are used from 1 to 78. The drawings take place twice daily, 12 numbers being drawn in the morning and 13 in the afternoon. The players bet on from one to four numbers, and win if they come out. The game is conducted secretly, in defiance to the law, by well-organized companies. It closely resembles a popular Chinese lottery, from which it was probably derived.

Polignac, MELCHIOR DE, 1661-1742. French diplomatist; Academician 1704; Cardinal 1712; Envoy to Rome 1725-32. *Anti-Lucretius*, 1745.

Polignac, JULES, DUC DE, d. 1817. French courtier, whose corruption and evil influence contributed largely to the Revolution.—His wife, IOLANTHE DE POLASTRON, 1749-1793, was an

Jules Polignac.

intimate of the Queen.—Their son, AUGUSTE JULES, 1780-1847, was made a Roman Prince 1820; French Premier 1829; imprisoned 1830-36.—His nephew, CAMILLE ARMAND, COMTE DE, b. 1832, was general C.S.A. 1862-65.

Polish. See SLAVONIC.

Polish Music. The folk-songs and dances of Poland have chiefly been introduced into polite music through the influence of Chopin. The dance most often associated with the country and its people is the Polonaise, but it is doubtful if this has a right to be Polish or even Slavonic, except by courtesy. It is a stately court dance, a procession in triple time, generally supposed to have appeared in Poland in the 16th century; critical research has demonstrated that the dance which served Chopin as a model came from Germany ab. 1700. The true popular dances of the Poles are the Mazurka, the Oberek, which strongly resembles it, and the Krakowiak, so called after the district of Cracow, where it is indigenous. In all these dances a peculiarly energetic and propulsive effect comes from the shifting of the dynamic stress, by syncopation or forced change of accent from the first beat to the second in a measure. Melodic peculiarities of Polish music are the occasional omission of the seventh of the scale and the use of augmented seconds, *i.e.*, intervals composed of three half-steps.

Politian. See POLIZIANO.

Political Arithmetic. Political economy; now sometimes science of statistics.

Political Economy. See ECONOMICS.

Political Offenses. Offenses committed in carrying on civil war or open insurrection are political offenses and are not included in treaties of extradition. Between a state and its subjects political offenses were formerly treated with great severity. At the present time the tendency is to treat them according to ordinary criminal law.

Political Parties. See the various parties under their separate heads.

Political Science. That branch of sociology which considers the form of government; especially in regard to its underlying principles, the relations of individuals to it and to one another, as far as affected by action of government, and similar subjects.

Politics. Science or study of good government or the right conduct of society as a whole; distinguished from ethics, the investigation of what is right for individuals.

Polity, ECCLESIASTICAL. Scheme of Ch. government. Three forms divide Protestant Christendom, each claiming N. T. warrant: 1. Episcopal, in which bishops are the chief of three orders; 2. Presbyterian, which regards the clerical office as single and of divine appointment; 3. Congregational, wherein clergy are set apart from laity merely for convenience, and the congregation is the center and head.

Poliziano, or **Politian,** ANGELO (orig. AMBROGINI), 1454-1494. Poet, dramatist, and translator; prof. Florence 1480. *L'Orfeo*, 1471. His high repute has stood the test of time.

Polk, JAMES KNOX, 1795-1849. Eleventh Pres. U. S.; M.C. from Tenn. 1825-39; Speaker 1835-39; was elected Pres. 1844 over Henry Clay by a majority of 65 electoral votes. The Mexican

James K. Polk.

War, resulting in the annexation of California and New Mexico, was waged during his administration. The organization of the Dept. of the Interior and a system of collecting revenues without the aid of the banks were important measures.

Polk, LEONIDAS, D.D., 1806-1864. Bp. of Ark. and Indian Territory, with jurisdiction over the s.w., 1838; Bp. of La. 1841; Major-gen. C.S.A. 1861; Lieut.-gen. 1862. He held commands in Ky., Tenn., and Miss., and was killed in Ga.—His father, WILLIAM, 1758-1834, and grandfather, THOMAS, ab.1732-1793, were revolutionary officers.

Polk, TRUSTEN, 1811-1876. Gov. of Mo. 1856; U. S. Senator 1857-62.

Polka. Bohemian dance, dating from 1830; known in England from 1843.

Polko, MME. ELISE (VOGEL), b. 1823. German novelist and biographer. *Mendelssohn*, tr. 1869.

Pollajuolo, ANTONIO, 1429-1498. Florentine goldsmith and medalist, best known as a sculptor; as a painter formal, painstaking, and rather dry, but still important. He has a fresco of St. Cristopher in the Metropolitan Museum of New York.—His brother, PIETRO, 1443-1496, was associated in his work.

Pollard, EDWARD ALBERT, 1828-1872. Ed. Richmond *Examiner* 1861-67. *Southern Hist. War*, 4 vols., 1862-66; *Lost Cause*, 1866.

Pollard, JOSEPHINE, ab.1842-1892. American writer of juvenile and religious books.

Pollarding. Method of cutting off the tops of trees so that they may throw out branches.

Pollen. Granular contents, microspores, of the anthers of flowers, generally appearing as a yellowish dust. The grains are unicellular, and usually consist of a double cell-wall, inclosing the protoplasmic contents.

Pollen-Sacs. Cavities of the anther, containing the pollen.

Pollen-Tubes. Tubular prolongations which protrude from pollen-grains when moistened, or on alighting on the stigma; consisting of an extension of the intine through a hole in the extine, and by means of which the ovules are fertilized.

Pollination. Natural or artificial deposition of pollen upon the stigma.

Pollinia. Pollen masses of orchids and milkweeds, formed by several grains being united together by a glutinous substance; also called Pollidia.

Pollinodium. Male organ of reproduction of certain of the lower *Thallophytes*.

Pollinoids. Male fertilizing sperm of certain *Algæ* and *Fungi*. They are excessively minute masses of protoplasm, having no cilia and but little power of spontaneous motion; in form they are globular or oblong.

Pollio, CAIUS ASINIUS, 76 B.C.-4 A.D. Latin writer, more eminent as an orator and patron of letters; Consul 40 B.C.; founder of the first public library at Rome; friend of Virgil. His poems, tragedies, and history of the Civil War are lost.

Pollock, SIR GEORGE, 1786–1872. English officer in India 1803–46; Major-gen. 1838; distinguished in Afghanistan 1842; Field-marshal 1870; Baronet 1872.—His brother, SIR FREDERICK, 1783–1870, was M.P. 1831; knighted 1834; Attorney-gen. 1834–35 and 1841–44; Chief Baron of the Exchequer 1844–66; Baronet 1866.—His 4th son, SIR CHARLES EDWARD, b. 1823, was knighted and made Baron of the Exchequer 1873. *Law of Shipping* (with F. P. Maude).—His nephew, SIR FREDERICK, b. 1845, became prof. of Jurisprudence at Oxford 1883. *Principles of Contract*, 1875; *Spinoza*, 1880; *Law of Torts*, 1887.—His brother, WALTER HERRIES, b. 1850, ed. *Saturday Review* 1884, has pub. poems and lectures.

Pollock, JAMES, LL.D., 1810–1890. M.C. 1844–49; Gov. of Pa. 1854–57; director U. S. Mint 1861–66 and 1869–80.

Pollock, OLIVER, 1737–1823. U. S. commercial agent at New Orleans 1777–83; financial backer of Gen. G. R. Clarke's memorable expedition of 1778. He rendered great public services, which, as with Robert Morris, brought him to poverty and imprisonment.

Pollok, ROBERT, 1798–1827. Scottish poet. *Tales of the Covenanters*, 1823. His *Course of Time*, 1827, had a great vogue.

Poll Tax. Direct tax laid upon individuals; in modern times usually equal on each person.

Pollux. See DIOSCURI.

Pollux, JULIUS, 2d cent. Greek grammarian, teacher at Athens; author of the *Onomasticon*, a species of dictionary in ten books.

Pollux, JULIUS, 10th cent. Byzantine historian.

Polo. Variety of Hockey or Shinney, but the players are on horse-back. It has long been a popular sport among the English cavalry officers and wealthy men of hunting and sporting proclivities, and has been introduced into America. It is

Polo.

too expensive to become common, as the game is hard upon ponies, and requires good ones. It is played upon any level field where the surface is good, and consists of driving a ball by means of a mallet through goals erected at either end of the field.

Polo, GASPAR GIL, ab.1540–ab.1590. Spanish author. His continuation of Montemayor's romance, *Diana Enamorado*, tr. 1598, was very popular.

Polo, MARCO, b. 1254–ab.1325. Venetian, noted for his travels in central Asia and China, 1271–92. His book was written in French, from his dictation, by Rustichello of Pisa, 1298–99, while a prisoner at Genoa, and was revised and tr. by other hands.

Polo de Medina, SALVADOR JACINTO, ab.1607–ab.1660. Spanish poet. *Gobierno Moral*, 1657.

Polonaise. Polish dance of slow movement in $\frac{3}{4}$ time.

Poltava. See PULTOWA.

Polyadelphia. Linnæan class of plants, distinguished by having the stamens united in more than two sets, as in St. John's-wort and Linden.

Polyadelphous. Flowers whose stamens are united in several sets.

Polyænus. 2d cent. Greek writer on stratagems in war. Most of his book is extant.

Polyandria. Linnæan class of plants, having many stamens, all inserted on the torus of the flower, as in the Pond-lily (*Castalia*), Pea, and the Poppy.

Polyandrous. Flower with many hypogynous stamens.

Polyanthous. Bearing numerous flowers.

Polyaxonia. Organisms exhibiting symmetric forms having a definite number of similar axes, as seen in many *Radiolaria*, some spores, etc.

Polybius, ab.204–ab.122 B.C. Greek patriot who opposed the Romans, by whom he was taken to Italy among the 1,000 Achæan hostages. At Rome he became intimate with the Æmilii; he accompanied Scipio to Africa and witnessed the destruction of Carthage. After the rebellion of Achæa, he acted as a mediator for his countrymen. He wrote a Greek History of Rome in 40 books, of which we possess five. He was conscientious, impartial, and used authorities carefully. His style is rather monotonous.

Polycarp, ab.69–155. Pupil of St. John; Bp. of Smyrna. An epistle of the Ch. there records his martyrdom; his letter to the Philippians was probably written ab.115.

Polycarpellary. Ovary consisting of many carpels.

Polychæta (BRANCHIATA). Marine chætopod annelids, with numerous setæ imbedded in parapodia. They usually have distinct head, tentacles, cirri and branchiæ; they are mostly diœcious, and develop with metamorphosis. There are two sub-orders, *Errantia* and *Sedentaria*.

Polychromy. Art of coloring statuary and buildings, practiced by nations of antiquity to a great extent, and still used by Oriental nations. The Japanese and Chinese are skilled in this art.

Polyclady. Production of an abnormally large number of branches.

Polycleitus, 5th cent. B.C. Greek sculptor of Sicyon, contemporary of Phidias and next to him in rank. No original works are extant, but copies of his spear-bearing youth (*Doryphoros*) and Athlete binding on the fillet of victory (*Diadumenos*) are known by later copies. His greatest work was the gold and ivory colossal Hera made for the temple at Argos. The Ludovisi Juno head is thought to be a copy. One of the types of the Amazon in later Græco-Roman art is probably derived from him. He was also an architect of great distinction, and designed the theater of Epidaurus.

Polycotyledonous. Plants bearing several cotyledons, as in many of the Pine family.

Polycrates. Tyrant of Samos ab.536–522 B.C. He had a large fleet and gained sway over the neighboring islands. After vainly casting his ring into the sea to propitiate the envious gods, he was finally allured to the mainland by the Satrap of Sardis and crucified.

Polycystidia. See GREGARINIDÆ.

Polycystina. Division of *Radiolaria*, consisting of a sarcode body inclosed by a siliceous, foraminated shell of great beauty and variety of shape. See POLYCYSTINIDÆ.

Polycystinidæ. Family of Monozoic *Radiolaria*. The shell is basket-shaped, silicious, and open at the broad pole. They form a very large part of the oceanic deposits.

Polycyttaria. See RADIOLARIA and PERIPYLÆA.

Polydactyla. Sub-ungulata. See UNGULATA.

Polydipsia. Constant desire for drinking with a sense of dryness in the throat and mouth, and increased flow of urine. It is symptomatic of fever.

Polyembryony. Development of more than one embryo in a seed or sperm-cell, a not uncommon phenomenon.

Polygalaceæ. Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising ab. 17 genera and 470 species of herbs and shrubs, widely distributed throughout the temperate and warm regions of the globe; called the Milkwort family.

Polygamous. Plants bearing both diclinous and hermaphrodite flowers.

Polygamy. Practice of one man having several wives at once; common among Israelites in O. T. times, sanctioned by the Koran, and prevalent among many savage and barbarous races.

Polygastrica. *Infusoria*, so named from the presence of vacuoles, containing food, in their endoplasm.

Polygenist. One who believes that man has had several independent origins, and is thus not a single species; *e.g.*, Agassiz, Pouchet, Poole.

Polyglot. Bible (rarely any other book) in several languages. The first was pub. in 6 vols. in Spain 1520; the next at Antwerp, 8 vols., 1569–72.

Polygnotus, 5th cent. B.C. Greek painter of high rank, who raised art to standards previously unknown. He came from Pharos, was active chiefly at Athens, and left some works at Delphi and Platæa.

Polygon, PLANE. Plane figure bounded by straight lines; regular, if the sides and angles are equal; convex, if no interior angle exceeds 180°.

Polygon, SPHERICAL. Portion of spherical surface bounded by three or more arcs of great circles. In ordinary usage each arc is less than a semicircle.

Polygonaceæ. Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising ab. 30 genera and 750 species, distributed throughout all parts of the earth; called the Buckwheat family.

Polygonometry. Extension of principles in trigonometry to the discussions of polygons other than triangles.

Polygordius. See ARCHIANNELIDS.

Polygynea. Orders of plants having numerous pistils.

Polygynœcial. Structure containing the pistils of several flowers.

Polygynous. Flowers with several pistils.

Polyhalite. Hydrous calcium-magnesium-potassium-sulphate, found in several of the salt-mines of Germany and Austria.

Polyhedral Angle. Opening between three or more intersecting planes meeting at a common point. Its measure is the portion of the surface of a sphere included between its facial planes.

Polyhedron. Solid bounded by four or more plane faces, regular when its faces are equal polygons. There are five regular polyhedrons: tetrahedron, octahedron, and icosahedron, having faces equilateral triangles; hexahedron, having faces squares, and dodecahedron, having faces pentagons.

Polyhistor, CORNELIUS ALEXANDER, 2d cent. B.C. Greek of Miletus, writer upon geographical and historical subjects.

Polyhymnia. Muse of lyric poetry.

Polymeniscous Eye. Compound or faceted eye. Always retinulate, it may be monostichous (lateral eyes of *Limulus*), or diplostichous, as in insects.

Polymerism. Compounds which have the same percentage composition, but different molecular weights, are said to be polymeric; *e.g.*, C_2H_2, C_4H_4, C_6H_6.

Polymerous. Flowers with numerous members in each series of parts.

Polymolybdic Acids. See MOLYBDIC ACIDS.

Polymorphism. Occurrence of several forms of animals in a species, as in Ants, where there are males, queens, workers, soldiers, etc. This phenomenon is best illustrated in certain colonial forms, as in the Siphonophores among the Hydroids, in which the colony of connected zoöids consists of individuals that have so far become different as to appear as mere organs of the colony-individual.

Polynesia. One of the major divisions of the Pacific, embracing those groups of islands which are peopled by races of Polynesian descent. These groups of islands have an area of nearly 115,000 sq. m., with ab. 250,000 Polynesian inhabitants.

Polynesian Languages. Those of the Pacific islands, associated with Malay under the name Oceanic, and of a very primitive structure.

Polynesians. Malay races of the Pacific islands. See SAMOANS, TAHITIANS, SANDWICH ISLANDERS, and MAORIS. The NEGRITOS (q.v.) originally occupied part of Polynesia, and the lighter-skinned, handsomer, and superior Malays invaded and subjugated the aborigines. The invaders have a cranial capacity equal to that of the European skull, and are brachycephalic. They are now nearly all Christianized, but are in process of extinction. Their characteristics are, large noses, black hair, coffee-colored skin, dignified bearing, and characters sensitive, melancholic, generous, though thievish, lazy, taciturn, and deceitful. Their weapons are clubs and spears, not bows and arrows. Beautiful tattooing by puncturing is practiced. Originally they were polygamous; some were cannibals. They had the germs of parliamentary proceedings and a great mythology. They are fond of dancing. See MELANESIANS and MICRONESIANS.

Polynices. Son of Œdipus and Jocasta; killed with his supporters in an attempt to regain the throne of Phebes, whence his brother Eteocles had expelled him. The two fell in fratricidal strife.

Polyp. Single individual, whether free, fixed, or a portion (zoöid) of a colony (cormus) of (1) the *Actinozoa* (corals), of (2) any of the Cœlenterates, or even of (3) the *Polyzoa*. See POLYPITE and POLYPS.

Polypary. Chitinous covering secreted by many *Hydrozoa*.

Polypetalous. Corolla consisting of a considerable number of petals; also known as Choripetalous, Dialypetalous, and Eleutheropetalous.

Polyphemus. One of the Cyclopes, son of Poseidon. He lived in a cave by Mt. Ætna, and devoured some of the companions of Ulysses, who saved himself by putting out the monster's one eye.

Polyphonic. In Music, style in which each voice in the composition pursues a melody of its own, all being bound together by the laws of counterpoint.

Polyphylitic Origin. Independent evolution of groups of animals from different or distinct ancestors that may have resembled one another, but were not necessarily closely related. On this theory, the different sub-kingdoms could have been independently evolved from different Protozoan ancestors. See MONOPHYLITIC ORIGIN.

Polyphyllous. Calyx or corolla composed of a considerable number of sepals or petals.

Polyphylly. Phenomenon of increase in the number of petals or sepals in flowers.

Polypidom. Dermal system of a colony of *Hydrozoa* or *Polyzoa*.

Polypite, or POLYPID. Separate zoöid of a Hydrozoön.

Polyplacophora. See PLACOPHORA.

Polypodiaceæ. Order of Ferns, including the largest number of genera and species.

Polypody. *Polypodium vulgare.* Fern of wide geographical distribution growing especially in rocky places.

Polypo-Medusæ. See HYDROZOA.

Polyporeæ. Family of *Fungi* of the order *Hymenomycetes*, including the woody species, which grow abundantly on the bark of trees and on dead wood. The mycelium of these plants causes the dry-rot of timber.

Polyprotodontia (RAPACIA). Division of Marsupials, having more than two incisors in the lower jaw, well developed canines, and cuspidate or sectorial molars. It includes one tribe, the *Rapacia* (Carnivorous Marsupials), of which there are two subtribes, ENTOMOPHAGA and SARCOPHAGA (q.v.).

Polypodium:
1, Polypodium dryopteris; 2, P. vulgare.

Polyps. Sack-shaped zoöphytic animals with several or

numerous finger-like processes, termed tentacles, surrounding the mouth. The term is usually restricted to members of that division of the *Cœlenterates* which includes the coral-formers, viz., the *Anthozoa*, erroneously called coral-insects, but is sometimes also applied to the Hydroids.

Polypterus. See CROSSOPTERYGII.

Polypus. Tumor-like body attached to the mucous membrane of any organ; *e.g.*, nose or ear. It is usually only the excessive growth of normal tissue, consequently not strictly a tumor.

Polysepalous. Calyx consisting of a considerable number of sepals; also known as Chorisepalous.

Polysiphonous. Thallus of certain red *Algæ*, in allusion to its structure consisting of a number of elongated tubular cells called siphons.

Polyspermous. Fruits containing several or many seeds.

Polyspermy. Entrance into an egg of more than one spermatozoön.

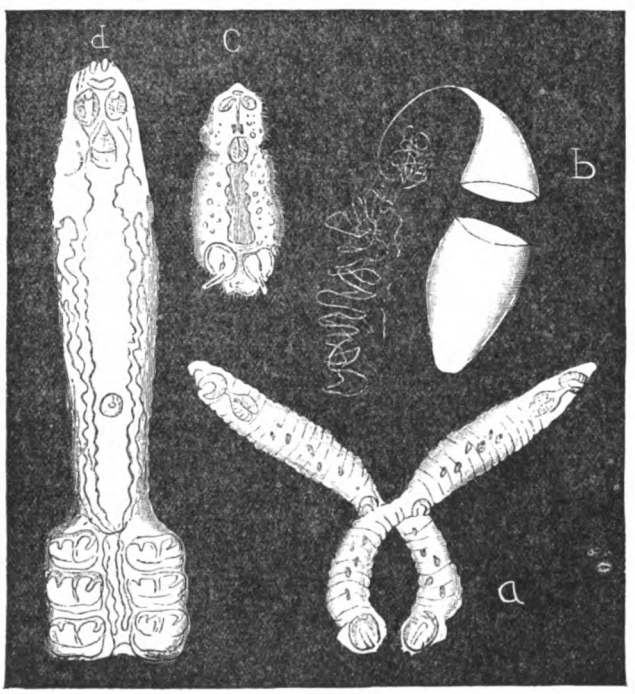
Polysporea. See COCCIDEA.

Polystemonous. Flowers with more stamens than petals.

Polystomæ. See RHIZOSTOMÆ.

Polystomata. See SPONGES.

Polystomea. Trematodes with two small suckers on the head, and one or more posterior suckers, with chitinous hooks; eyes, and sometimes bristles, are present. They are mostly ectoparasitic. The body is sometimes externally segmented. Here belongs *Diplozoön*, which consists of two hermaphrodite



a, Diplozoon (*Diplozoon paradoxum*); b, Egg (case); c, Larva; d, Diporpa.

individuals fused in an X fashion to secure mutual cross-fertilization. The single animals before fusion are known as *Diporpæ*. Here also is the viviparous *Gyrodactylus*, in which a process of pædogenesis takes place. They are small, but with large caudal disks, on which are a number of suckers.

Polytechnic Schools. See TECHNICAL SCHOOLS.

Polythalmia. See RETICULARIA.

Polythalmic. Collective fruits.

Polytheism. Popular form of Paganism, founded on Pantheism, and dividing the universe into many personified Powers, each capable of receiving a distinct worship.

Polythionic Acids. Series of acids, consisting of hydrogen, oxygen, and sulphur, in which the proportion of sulphur increases; *e.g.*, $H_2S_2O_6$, dithionic acid; $H_2S_3O_6$, trithionic acid; $H_2S_4O_6$, tetrathionic acid; $H_2S_5O_6$, pentathionic acid.

Polytrichaceæ. Order of *Musci*, containing the Haircap Moss and its allies.

Polytriglyph. In Doric Architecture, an arrangement by which more than two triglyphs are introduced between two columns.

Polytrochal. Having several circles of cilia in the larva, as in certain Annelids.

Polyuria. Excessive secretion of urine. It may be temporary as in the crisis of certain fevers, or permanent when it is a symptom of some chronic disease, as diabetes.

Polyzoa. See BRYOZOA.

Polyzoarium. Polypidon of a polyzoön.

Polyzygosis. In Biology, conjugation of several gametes.

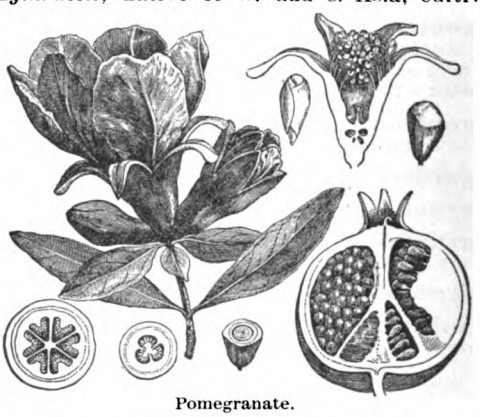
Pomaceous. In Botany, structures resembling an apple.

Pomade. Pharmaceutical preparation of lard or stearine, scented with some essential oil, used in dressing the hair or applied to the face.

Pombal, SEBASTIAN JOSEPH DE CARVALHO E MELLO, MARQUIS OF, 1699–1782. Portuguese Ambassador to England 1739, and to Austria 1745; Foreign Minister 1750–56; Premier 1756–77; Marquis 1770; eminently able and useful. He rebuilt Lisbon after the earthquake of 1755, expelled the Jesuits 1759, abolished slavery, and carried important reforms.

Pome. Fleshy fruit consisting of several carpels inclosed in the thickened calyx or receptacle, as the Apple, Pear, and Quince.

Pomegranate. *Punica granatum.* Tree of the natural family *Lythraceæ*, native of w. and s. Asia, cultivated in



Pomegranate.

tropical countries for its pulpy, edible fruit. In some parts of Europe it is used as a hedge plant.

Pomerania. German province on the Baltic; long held by the Wends; governed by its own dukes from 1062; converted by Bp. Otto ab.1125; divided between Prussia and Sweden 1637. Sweden gave up most of her portion in 1728. The whole, since 1815, belongs to Prussia.

Pomeranian Dog. Name given to the SPITZ DOG (q.v.).

Pomeroy, JOHN NORTON, LL.D., 1828–1885. Prof. Univ. New York 1864–69, and Univ. Cal. from 1878. *Introduction to Municipal Law*, 1865; *Equity Jurisprudence*, 1881–83.

Pomeroy, MARCUS MILLS ("BRICK"), 1833–1896. Journalist in Wis., Chicago, and New York. *Sense*, 1868; *Brick Dust*, 1872.

Pomeroy, SAMUEL CLARKE, b. 1816. U. S. Senator from Kan. 1861–73.

Pomeroy, SETH, 1706–1777. Officer in the French wars, 1745 and 1755; Brig.-gen. 1775; Commander of some Mass. militia 1776.

Pomme Blanche. *Psoralea esculenta.* Herb of the natural family *Leguminosæ*, with a large farinaceous root, native of the prairie region of the n. central U. S.; called also Pomme de Prairie.

Pomology. Study of fruits.

Pomona. Roman goddess presiding over fruit trees. Ovid and Propertius have tales of her lovers.

Pompadour, JEANNE ANTOINETTE POISSON, MARCHIONESS DE, 1721–1764. Mistress of Louis XIV. from 1745. She exercised a detrimental influence upon public affairs.

Pompeii. Ancient Greek colony, and subsequently Roman town, on the Bay of Naples, destroyed and buried by a volcanic eruption of ashes and mud from Mt. Vesuvius 79. Excavations were undertaken 1748, and are still in progress, but the best and most important results were generally the early ones. All objects found here are kept in the Naples Museum, which therefore has the most remarkable collection of domestic utensils and furniture in existence. The frescoed decorations of the Pompeiian walls are also our best surviving reference for Greek painting, as here known by the copies or inventions of the house-decorators. Many of these frescoes are still in position, but the best are in the Naples Museum. The public buildings which survive are not especially large,

but are in generally excellent preservation, especially the baths. No houses in P. were more than two stories high

Forum of Pompeii.

where they faced the street level, and only a few have preserved any remains of the upper story.

Pompey (CNEIUS POMPEIUS), 106–48 B.C. Roman general under Sulla 84; allowed a triumph and the surname Magnus 81 for victories over the Marian party in Africa; Proconsul in Spain 76–71; Consul 70. In 67 he cleared the Mediterranean of pirates; in 66 he succeeded Lucullus in command of the war with Mithradates, which he easily finished. In 60 he triumphed again, and formed a triumvirate with Cæsar and Crassus. The death of his wife, Julia, Cæsar's daughter, 54, severed the last link binding him to Cæsar. He was sole consul 52, and became head of the aristocratic party. Civil war followed: he was defeated at Pharsalia, and assassinated in Egypt. See CÆSAR.

Pompey's Pillar. Near Alexandria; of red granite, 73 ft. in height, and ab. 30 ft. in circumference, standing on a pedestal 25 ft. high; raised ab. 296 in honor of Diocletian.

Pomponatius, or **Pomponarri,** PIETRO, 1462–1524. Prof. at Padua and Bologna; expositor of Aristotle. He maintained as matter of faith what he denied as a philosopher. His book on the *Immortality of the Soul*, 1516, was publicly burned.

Pomponius, LUCIUS, 1st cent. B.C. Latin author of *Fabulæ Atellanæ*. Fragments remain.

Ponce. Seaport town on s. coast of Porto Rico, W. I. Pop. ab. 30,000.

Ponceau. Variety of azo coloring matters, which are naphthalene derivatives, and which dye red shades upon wool.

Ponce de Leon, JUAN, ab.1460–1521. Companion of Columbus 1493; Gov. of Porto Rico 1510; discoverer of Florida 1512, while in search of the "fountain of perpetual youth." On a second expedition thither he was mortally wounded by Indians.

Ponce de Leon, LUIS, 1527–1591. Spanish Augustinian, prof. Salamanca from 1561; imprisoned for five years by the Inquisition; lyric poet, translator, and commentator.

Poncelet, JEAN VICTOR, 1788–1867. French mathematician and officer of engineers. His chief work is a treatise on the projective properties of figures, 1822.

Poncelet Wheel. Early form of reaction water wheel, in which the water was let on below the horizontal diameter of a wheel on horizontal axis, as in the case of an undershot wheel. But the buckets were curved, and the water entered with a velocity which was imparted to the periphery of the wheel as the water was arrested by the vertical curve of the buckets. The water dropped without tangential velocity from the buckets as they emptied, on the ascent. The efficiency of such wheels varies from 48 to 60 per cent.

Ponchielli, AMILCARE, 1834–1886. Italian composer of operas.

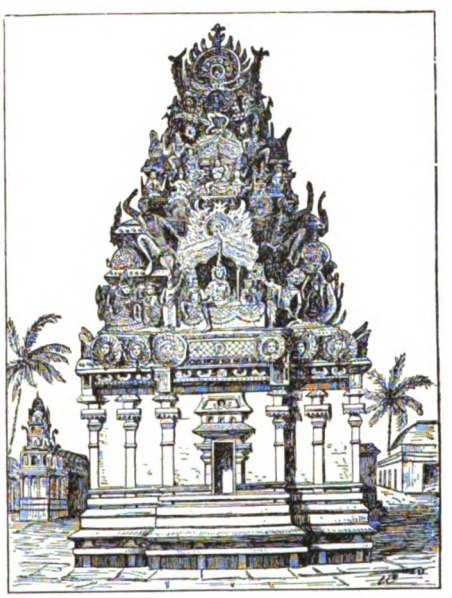
Poncho. Piece of woolen or rubber cloth to shed rain, having a slit in the middle, through which the wearer passes his head, so that the poncho rests upon the shoulders and hangs down in front and behind; frequently used by mounted troops; worn by gauchos of S. America.

Pond, ENOCH, D.D., 1791–1882. Prof. Bangor Theol. Sem. 1832, pres. 1856; voluminous theological and polemic writer.

Pond, JOHN, F.R.S., 1767–1836. English astronomer royal 1811; translator of Laplace's *System of the World*, 1809.

Ponderation. Gravitation or weight of the air; so called by Hooke 1715.

Pondicherry. Capital of French settlements in India; on the Bay of Bengal, 83 m. s. of Madras; founded 1674; held



Portico of a Pagoda at Pondicherry.

by the Dutch 1693–97, by the English 1761–63, 1778–83, and 1793–1816. Pop., 1889, 41,253.

Pond Lily. See WATER LILY.

Pondweed. Purple-flowered aquatic herbs of the genus *Pontederia*, natural family *Pontederiaceæ*, of wide geographical distribution in America.

Pondweed, HORNED. *Zannichellia palustris.* Aquatic plant of the natural family *Naiadaceæ*, native of the n. hemisphere.

Poniatowski, JOSEPH, 1816–1873. Operatic composer, of a famous Polish family. *Don Desiderio*, 1868.

Poniatowski, STANISLAS, PRINCE, 1677–1762. Polish statesman and general, prominent in support of Charles XII. of Sweden.—His son, STANISLAS AUGUSTUS, 1732–1798, was King of Poland 1764–95.—His nephew, JOSEPH ANTONY, PRINCE, 1762–1813, was a capable general in several wars with Russia, joined the French 1812, was distinguished at Borodino and Leipzig, became Marshal, and was drowned in the Elster.

Ponsard, FRANÇOIS, 1814–1867. French dramatist. *Ulysses*, 1852.

Ponson du Terrail, PIERRE ALEXIS, VICOMTE DE, 1829–1871. French novelist. *Coulisses*, 1853.

Pons Sublicius. Oldest Roman bridge over the Tiber, believed to have been built 621 B.C. on piles by Ancus Martius, celebrated for the combat of Horatius Cocles. The only bridge at Rome until 2d century B.C.

Pons Variolii. Bridge forming the bond of union between the various parts of the brain; the cerebrum and cerebellum above and the medulla oblongata below. It is located at the base of the brain just posteriorally to the mathematical center.

Pont, TIMOTHY, ab.1560–ab.1620. Scottish surveyor and cartographer.

Pontano, JEAN JOVIEN, 1426–1503. Italian poet and historian.

Pontchartrain. Lake of e. La., n. of New Orleans, between the Mississippi and the Gulf, ab. 40 m. by 25.

Pont du Gard. The aqueduct bridge across the Gard, France, 10 m. below Nimes, over which the water of the Aure was carried to that city. See AQUEDUCT.

Ponte Delgada. Largest town of the Azores Is., on the s. coast of San Miguel. Pop. ab.20,000.

Pontederiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 4 genera and ab. 35 species of aquatic herbs, widely distributed in tropical and temperate regions; most numerous in America; called the Pickerel-weed family.

Pontiac, ab.1720–1769. Chief of three allied Indian tribes; author of a plot, extending through the entire west, whereby 8 British garrisons were massacred May 1763. He besieged Detroit May–Oct. 1763. The war ended 1766.

Pontianak. Capital of Dutch w. Borneo. Pop. ab. 14,000.

Pontianus. Bp. of Rome 230–235.

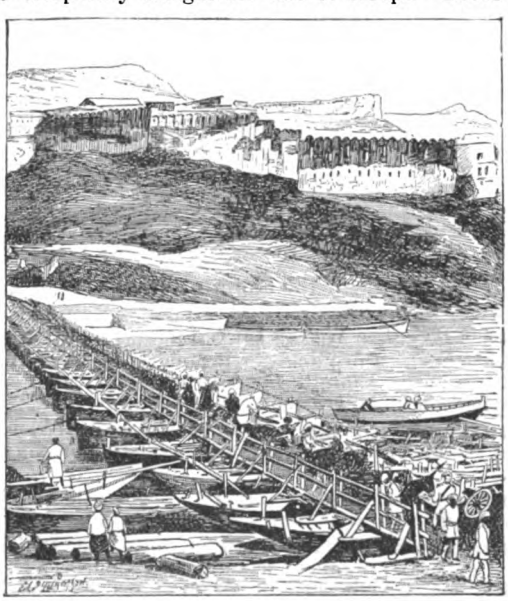
Pontifex Maximus. Chief of the Roman colleges of priests. Under him stood the Rex Sacrificulus, who represented the kingly office in those sacrifices which the kings had anciently performed, the Flamines and the ordinary Pontifices. He resided in the Regia on the Forum. The office was held by Julius Cæsar, and afterward by the emperors. The title is now borne by the Pope, as that of pontiff is by bishops.

Pontifical High Mass. Celebrated by a bishop or mitered abbot in full attire: said by the Pope, with peculiar rites, it is a Papal high mass.

Pontine Marshes. Low marshy plain on w. coast of Italy, s. of Rome; in Augustus' day partly drained by a navigable canal; now miasmatic and unhealthy. The Appian Way ran through them.

Pontois, JEAN FÉLIX HONORÉ, b. 1837. French judge, playwright, legal and political writer.

Pontoons. Boats, cylinders, or other contrivances to support temporary bridges for use of troops. Those of the



Bridge of Boats at Attock, Punjab, India.

U. S. Army are 31 ft. long, 2 ft. 8 in. deep, 5 ft. 8 in. wide at top and 4 ft. 5 in. wide at bottom, placed 20 ft. apart.

Pontoppidan, ERIK, 1698–1764. Bp. of Bergen 1745; prof. Univ. Copenhagen 1738; Chancellor 1755; historical and theological writer.

Pontormo, JACOPO DI (CARUCCI). 1494–1557. Italian painter.

Pontus. Kingdom of n. e. Asia Minor, on the Euxine, e. of the Halys: founded ab.380 B.C.; most powerful under Mithradates VI., 120–63 B.C., who waged three wars with Rome, 88–84, 83–82, and 74–63 B.C., the latter conducted by Lucullus till 66, then by Pompey. Pontus became a Roman province 62.

Pontzen, ERNEST, b. 1838. Hungarian civil engineer, in Austria till 1876, since then in France; engaged on many railways and other public works in various countries; professional writer.

Pony. See HORSE.

Poodle. Breed of intelligent dogs, having extremely long and curly hair, brown, black, or white, weight 5 to 40 lbs. They are generally clipped bare, with the exception of the shoulders and tufts on their legs. They originated ab.1600, and were introduced into England ab.1800.

Pool. See BILLIARDS.

Pool, MARIAN LOUISE, b. 1845. American novelist. *Dally*, 1893; *Mrs. Gerald*, 1896.

Poole, JOHN, 1792–1879. English playwright and satirist. *Paul Pry*, 1825; *Little Pedlington*, 1839.

Poole, MATTHEW, 1624–1679. London rector, ejected 1662; active in controversy. *Synopsis Criticorum Bibl.*, 5 vols., 1669–76. His *Annotations on the Bible*, extending to Isa. lviii., were completed by other hands, and pub. 1685.

Poole, REGINALD STUART, 1832–1895. Archæologist and numismatist; prof. Univ. Coll., London, 1889.

Poole, WILLIAM FREDERICK, LL.D., 1821–1894. Librarian in Boston 1852–69, and Chicago from 1874. His *Index to Periodical Literature*, begun 1848, was repeatedly enlarged.

Poona. Town of s. w. India, near the e. base of the Ghauts, 119 m. s.e. of Bombay; former capital of the Mahrattas; held by England since 1818. It is a military station, and has several colleges and schools. Pop., 1891, 160,460.

Poop. Highest and aftermost deck of a ship.

Poor, CHARLES HENRY, U.S.N., 1808–1882. Commodore 1863; Rear-admiral 1868.

Poor, DANIEL, D.D., 1789–1855. American missionary in Ceylon from 1816.

Poor, ENOCH, 1736–1780. N. H. patriot; Colonel 1775; Brig.-gen. 1777; distinguished at Saratoga and elsewhere.

Poore, BENJAMIN PERLEY, 1820–1887. American journalist and historical writer.

Poore, HENRY R., b. 1858. American painter.

Poor Laws. Constitutional and statutory provisions for the care and support of those who are unable to support themselves.

Poor Man's Weather-Glass. See PIMPERNEL.

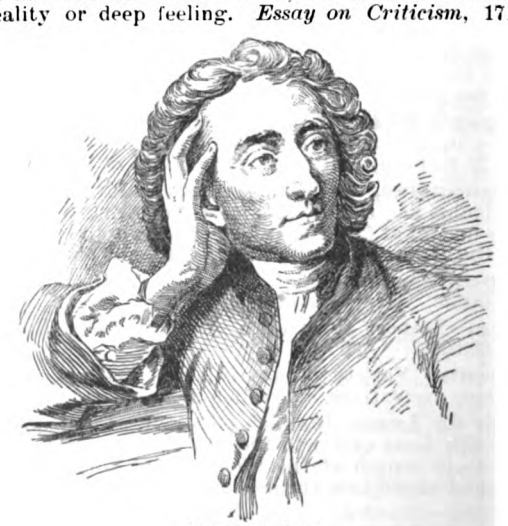
Poor Men of Lyons. See WALDENSES.

Poorsen-Schwartz. See MAARTENS, M.

Pope. In the East, a parish priest; in the West, the Bishop of Rome, declared by the Vatican Council, 1870, to have universal jurisdiction. In the received list the popes number 254; in this work all are mentioned under their official names. See BENEDICT, CLEMENT, GREGORY, INNOCENT, JOHN, PIUS, etc.

Pope, ALBERT AUGUSTUS, b. 1843. American manufacturer, active in advocating the improvement of roads.

Pope, ALEXANDER, 1688–1744. English poet, head of the "classical school"; eminent for intellectual brilliancy and mastery of his favorite form of verse, the heroic stanza, but not for ideality or deep feeling. *Essay on Criticism*, 1711; *The*



Alexander Pope.

Messiah, 1712; *Rape of the Lock*, 1712–14; tr. *Iliad*, 1715–20; tr. *Odyssey*, 1725; *Dunciad*, 1728–43; *Essay on Man*, 1733–34; *Moral Essays*, 1735; *Imitations of Horace*, 1738. He was unsurpassed in wit, satire, mastery of the couplet, and the turning of maxims; no other English poet, after Shakespeare, has been so

extensively quoted. Lyrics he seldom attempted, but the much berated *Universal Prayer*, 1738, is one of his finest productions. His influence was supreme till near the end of the century, when Cowper and Burns led a reaction from artificiality to nature.

Pope, JOHN, U.S.A., 1822–1892. Brig.-gen. U. S. Vols. 1861, commanding in Mo.: Major-gen. 1862; captured 1862. He took Island No. 10 April 8, and commanded the armies of Va. and the Potomac June–Sept. He was made Major-gen. U.S.A. 1882, and retired 1886.

Pope Joan. Old English card game, in which the Nine of Diamonds was called the Pope and entitled to certain privileges. The modern English game of Newmarket or Stop is derived from this.

Popham, GEORGE, ab.1550–1608. Head of the first company of English settlers in New England, which left England 1607 and settled at the mouth of the Kennebec.—His relative, SIR JOHN, 1531–1607, Attorney-gen. 1585 and Lord Chief-justice of King's Bench from 1592, was one of the patentees. *Reports*, 1656.

Popinjay. Old mark for archers, in form of a bird.

Popish Plot. Invented and "exposed" 1678. See OATES, TITUS.

Popkin, JOHN SNELLING, D.D., 1771–1852. Prof. Harvard 1815–33. *Greek Grammar*, 1828.

Poplar. Trees of the genus *Populus*, natural family *Salicaceæ*, natives of the n. temperate zone; also *Liriodendron tulipifera*, the Tulip-tree of e. N. America. The Balsam Poplar, or Tacamahac of N. America, is *Populus balsamifera*.

Popocatapetl. Volcanic peak 43 m. s.e. of Mexico; ht. 17,784 ft.

Poppet Head, or HEAD GEAR. Structure, with its appurtenances, built over a shaft to carry the sheaves that guide the hoisting rope.

Poppet Valves. Form of valve much used for engines of large cylinder volume, and by paddle-wheel steamboat engines, to the exclusion of any other type. They open a large port area rapidly, and are very easily balanced. Two disks are secured to one vertical stem. The disks are the valves proper, and seat upon suitable seats. These seats are so arranged that the space between them communicates through a port to the cylinder, and in the space above and below the disks there is the same pressure, which may be boiler pressure for the steam side, and the pounds of vacuum for the exhaust side. Hence the valve lifts easily by exerting only so much effort as is necessary to overcome the pressure on the difference of area of the upper and lower disks. Usually the lower disk is a little smaller, so that it may drop through the seat of the upper disk. Such valves are usually operated by cam motions.

Poppy. *Papaver somniferum*. Pink-flowered herb of the natural family *Papaveraceæ*, native of the Old World, extensively cultivated for its seed-vessels, whose milky juice yields the narcotic substance opium. The red-flowered Corn Poppy of Europe is *P. rhœas*. See OPIUM.

Poppy, HORNED. *Glaucium luteum*. Weed of the Poppy family, native of Europe, introduced into the U. S.

Poppy, MEXICAN. *Argemone Mexicana*. Prickly showy-flowered herb of the Poppy family, native of Mexico and the s.w. U.S., occasional in cultivation as a garden flower.

Population, LAW OF. As most generally accepted, it is that population tends to increase more rapidly than the means of subsistence, and would soon lead to an ever increasing amount of misery, if certain positive or preventive checks did not keep the numbers down.

Population of the World. See WORLD, POPULATION OF.

Porcelain. Variety of POTTERY (q.v.) which originated in China during the Han dynasty, 206 B.C.–25, hard porcelain. The manufacture was introduced into Japan 1513. In 1710 Frederick Böttger (1682–1719), an alchemist of Saxony, discovered the method of manufacture, and a factory was established at Meissen near Dresden by Augustus II., the Dresden works. In 1720 the Vienna works were established, and in 1751 porcelain was made in Berlin. The works at Sevres, France, were founded 1745, but until 1770 soft porcelain only was made. Works were also established at St. Petersburg, Copenhagen, and elsewhere in Europe. Porcelain is hard, transparent, sonorous, and difficultly fusible. The body of the ware is composed of kaolin and feldspar. The ware is inclosed in earthenware pots, seggars, and baked at a high temperature in the kiln for 40 hours. It is then dipped in the glaze, ground feldspar and quartz, suspended in water, and baked again at 1,600° C. to fuse the glaze. Painting of porcelain is accomplished by mixtures of metallic oxides with borax and other fluxes, applied upon the glaze and fused in a muffle. Colors are also laid on before the glaze. Soft porcelain is a variety of glass, and that of Sevres was composed of white sand 60, niter 22, salt 7.2, alum 3.6, soda 3.6, gypsum 3.6. This was roasted and washed, and to this was added chalk 2 and pipe-clay 1. After grinding, soap and glue were added to give plasticity. The glaze was a silico-alkaline glaze with oxide of lead. This manufacture was suspended ab.1800, but has been slightly revived.

Porcelain, REAUMUR'S. See REAUMUR'S PORCELAIN.

Porcelain Clay. Finer and purer kind of kaolin, suitable for the manufacture of the higher grades of ware.

Porcellanite. Argillaceous rock baked and altered by contact with an igneous rock.

Porcellanous. Having the texture of porcelain, as certain foraminiferal shells.

Porch. Covered entrance-way into a church or other building; formerly confounded with portico, which stood by itself, as that used by the Greek Stoics. In English churches it was quite universal, and in France beautiful mediæval specimens remain.

Porch of Aldham, Essex, Eng. (1350).

Porcupine. Rodent, in whose fur some of the hairs are developed as spines, barbed at the point. In some species these may be over a foot long. They are easily detached, are situated mostly on the back, and can be hurled like arrows from the tail. The American porcupines are arboreal, and some have prehensile tails; *Erithizon*, the common porcupine, is 2½ ft. long. A number of species are found in Africa. 2,000,000 porcupine quills are imported into England every year from India, for penholders and ornamental purposes. See HYSTRICOMORPHA.

Pordage, JOHN, 1608–1698. Founder of the London Philadelphian Society. *Mystic Divinity*, 1683.

Pordenone, 16th cent. Two Venetian painters of subordinate rank. See LICINIO.

Pores (OF SPONGES). See INHALENT PORES.

Porgy, or SCUP (STENOTOMUS CHRYSOPS). Acanthopterygian fish which arrives in schools off the coast of New England in May, and earlier further s. The largest spawners arrive first. They weigh up to 4 lbs., and attain a foot and a half in length. They are easily caught and are usually so abundant that nearly 1,000 lbs. can be daily caught by a quick fisherman. The bait used is clams.

Porifera. See SPONGES.

Porism. Proposition seeking such conditions as shall make a certain problem indeterminate.

Pork. The flesh of the pig, sold fresh or salted. In the year ending March 1, 1896, 20,480,000 hogs were packed and sold in U. S. In the year ending June 30, 1895, there were exported from U. S., bacon 452,549,976 lbs., hams 105,494,123 lbs., pork 58,266,893 lbs., lard 616,310,992 lbs.; total value $89,696,768. In 1890 the number of hogs in U. S. was estimated to be 42,842,759.

Porosity. Quality of the matter of which any body is composed, when not strictly continuous, but possessing interstices or pores between the molecules. We may distinguish between two kinds of pores, sensible, such as exist in a sponge or a piece of bread and are visible to the eye, and physical, which exist in all forms of matter and are the intermolecular spaces, which cannot be perceived by the senses.

Porphyraceæ. Sub-order of red *Algæ*, containing the Purple Laver and a few other species.

Porphyrio, POMPONIUS, 4th cent. Latin commentator on Horace.

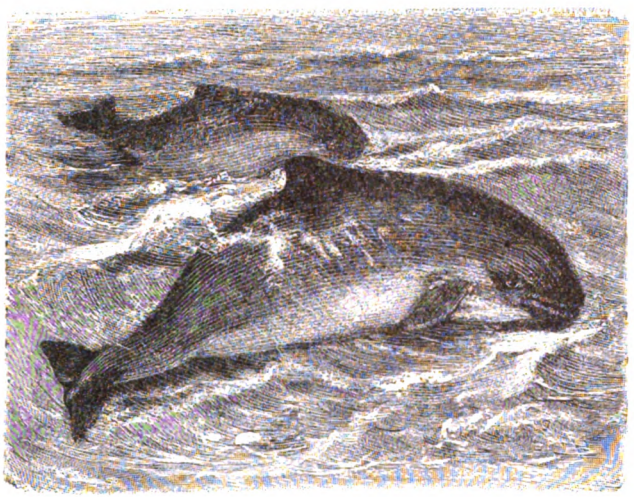
Porphyrogenitus. Constantine VII., 905–959; emperor of the East from 944.

Porphyry. Originally, rock in which feldspathic crystals were distributed in a purplish matrix; now any rock containing mineral distinctly differentiated by crystallization from the main mass.

Porphyry, 232–ab.304. Neo-platonic philosopher, disciple and biographer of Plotinus. His doctrine is of a practical and religious character; but he wrote against Christianity. Most of his works have perished.

Porpita. See DISCOIDEÆ.

Porpoises (SEA-HOGS). Small Cetaceans of genus *Phocæna*, allied to the Mammalian dolphins (sometimes called porpoises), from which they differ in having a more rounded head; no beak is present. The pectoral fins are below and be-



Porpoises (*Phocæna communis*).

hind the eyes. Teeth are ab. 25 on each side of each jaw. The Atlantic species go in larger schools and ascend rivers further than do the Pacific species. They feed on herrings, etc. Porpoise leather is usually made from the skin of the white whale (*Beluga*).

Porpora, NICCOLA, 1686–1766. Neapolitan composer and vocal teacher, celebrated by George Sand in *Consuelo*.

Porridge. Nutritious food made by boiling barley, beans, or oatmeal in milk or water. That of oatmeal was the chief food of the Scotch peasantry.

Porro, EDUARDO, b. 1842. Prof. of Obstetrics at Milan; professional writer.

Porsena, LARS. King of Clusium in Etruria, who with a vast army undertook to replace Tarquin the Proud on the throne of Rome. The legend has it that Cocles prevented his crossing the bridge over the Tiber. In fact, Rome was conquered and compelled to pay tribute.

Porson, RICHARD, 1759–1808. Fellow of Trinity Coll., Cambridge, 1782; pre-eminent (after Bentley) as a Greek scholar and textual critic. He edited Æschylus and part of Euripides, and left some essays.

Port. Larboard side of a ship: left side, looking forward.

Porta, BACCIO, or BARTOLOMMEO, DELLA. See BARTOLOMMEO.

Porta, CARLO, 1776–1821. Milanese poet.

Porta, GIACOMO DELLA, d. 1604. Italian architect.

Porta, GIAMBATTISTA DELLA, 1543–1615. Neapolitan pioneer of the sciences; inventor of the camera obscura. *Natural Magic*, 1569.

Portage. Subdivision of the DEVONIAN (q.v.) in N. Y., consisting of dark shales, and intermediate between the Genessee below it and the Chemung above. This shale cannot be clearly distinguished in its western extensions.

Portal. Entrance, particularly applied to the deep and richly carved doorways of Gothic cathedrals.

Portales, DIEGO JOSÉ VICTOR, 1793–1837. Vice-pres. of Chili 1832; Minister of War 1835; shot by mutineers.

Portalis, JEAN ÉTIENNE MARIE, 1745–1807. French Minister of Worship 1804; chief author of the *Code Napoléon*.

Port Arthur. Harbor and town of Manchuria, China; taken by the Japanese Nov. 22, 1894. Pop. ab. 6,000.

Port au Prince. Capital, principal city, and a seaport of Hayti, at the head of the Bay of Gonaives; settled 1749. Nearly all the houses are of wood, building with stone being

Port au Prince.

abandoned on account of earthquakes. Steamers load and discharge by lighters. Pop. ab. 40,000.

Portcullis. Barrier of stout wooden beams, shod with iron, which can be lowered rapidly in case of surprise; they were suspended near or over the gates at the posterns of old masonry forts and castles.

Porte. Government of the Turkish empire; "gate" of the Sultan's palace, at which justice is supposed to be dispensed.

Porte Cochère. Carriage entrance to courtyard of a house.

Port Elizabeth. On Algoa Bay, in e. Cape Colony, 350 m. s. of Kimberley; settled 1820. Pop., 1891, 23,266.

Porteous, JOHN, d. 1736. Commander of Edinburgh City Guard, sentenced July 20 to death for firing on a crowd April 14, respited Aug. 26, lynched Sept. 7, as told in Scott's *Heart of Midlothian*.

Porter. See BEER.

Porter, ALBERT G., b. 1824. M.C. 1859–63; Gov. of Ind. 1881–84. *Decisions Ind. Supreme Court*, 5 vols., 1853–56.

Porter, ALEXANDER, 1786–1844. Judge La. Supreme Court 1821–33; U. S. Senator 1834–37 and 1843.

Porter, ANDREW, 1743–1813. Revolutionary officer; Brig.-gen. Pa. militia 1801.—Of his sons, DAVID RITTENHOUSE, 1788–1867, was Gov. of Pa. 1838–45; GEORGE BRYAN, 1791–1834, was Gov. of Mich. from 1832.—His son, ANDREW, U.S.A., 1820–1872, was Brig.-gen. U. S. Vols. 1861–64.—His cousin, HORACE, U.S. A., b. 1837, was on the staffs of Gens. McClellan, Rosecrans, and Grant 1862–65, and was sec. to Pres. Grant 1869–73. *West Point Life*, 1866.

Porter, CHARLES T., b. 1826. American mechanician; inventor of two governors, 1859–61; designer and manufacturer of the PORTER-ALLEN ENGINE (q.v.).

Porter, DAVID, U.S.N., 1780–1843. Commander of the *Essex*, 1812, which took sundry British vessels, and was taken 1814; in the Mexican service 1826–29; U.S. Minister to Turkey from 1831. *Cruise in the Essex*, 1815; *Constantinople*, 1835. His *Life* was pub. 1875 by his son, DAVID DIXON, U.S.N., 1813–1891, who held command on the Mississippi 1862–63, and on the Atlantic coast 1864–65, winning great distinction and the rank of Rear-admiral 1863. He became Vice-admiral 1866, and Admiral of the Navy 1870. *Allen Dare*, 1885; *Harry Marline*, 1886; *Hist. Navy in War of Rebellion*, 1887.—His brother, WILLIAM DAVID, U.S.N., 1809–1864, served with distinction in the West, and became Commodore 1862.

Porter, FITZ-JOHN, U.S.A., b. 1822. Cousin of Admiral David D.: Brig.-gen. U.S. Vols. 1861; active at Yorktown and in command of the 5th Corps; Major-gen. 1862. After distinguished service in sundry battles, he was unjustly cashiered Jan. 21, 1863, for alleged disobedience at the 2d Bull Run. He was vindicated by later investigation, and restored to the army 1886.

Porter, JAMES DAVIS, LL.D., b. 1828. Gov. of Tenn. 1874–79.

Porter, JANE, 1776–1850. English romancer. *Thaddeus of Warsaw*, 1803; *Scottish Chiefs*, 1810.—Her sister, ANNA MARIA, 1780–1832, pub. many novels.—Her brother, ROBERT KER, 1775–1842, painter, pub. several books of travel.

Porter, JOSIAS LESLIE, D.D., LL.D., 1823–1889. Prof. Bel-

fast 1860; pres. Queen's Coll. 1879. *Damascus*, 1855; *Syria and Palestine*, 1858.

Porter, NOAH, D.D., LL.D., 1811–1892. Prof. Yale from 1846, pres. 1871–86. *Human Intellect*, 1868, abridged 1871; *Moral Science*, 1885; *Kent's Ethics*, 1886.

Porter, PETER BUEL, 1773–1844. M.C. from N. Y. 1809–12 and 1815–16; officer in the war of 1812, distinguished at Chippewa, Lundy's Lane, and Fort Erie; a projector of the Erie Canal; Sec. of War 1829–33.

Porter, RUFUS, 1792–1884. American inventor of various machines; founder *Scientific American* 1845.

Porter, THOMAS CONRAD, D.D., LL.D., b. 1822. Prof. Lafayette Coll. from 1866; writer on the botany of Pa.

Porter, WILLIAM TROTTER, 1809–1858. Ed. New York *Spirit of the Times* 1831–56; writer of sporting tales.

Porter-Allen Engine. High-speed horizontal type of steam engine, embodying the improvements made upon the ALLEN ENGINE (q.v.) by Charles T. Porter. These were a weighted governor, by which sensitiveness was given to it, and the adoption of such weight in the reciprocating parts as should act at early cut-offs with high-pressure steam to absorb work in their acceleration during the first half of the stroke, and give it out on the retardation of those parts in the latter half when the cylinder pressure had fallen by expansion. This was the first development of high speeds of pistons for stationary practice, the reciprocating parts acting as a fly-wheel, and making less weight necessary in the revolving wheel. Previous to 1865 engines made 20 to 60 revolutions a minute; Porter-Allen engines of the same power make from 175 to 300 revolutions per minute, and an engine of less bulk suffices.

Porteus, BEILBY, D.D., 1731–1809. Bp. of Chester 1776, and of London 1787. *Works*, 6 vols., 1811.

Port Hudson. Village of La., on the Mississippi; fortified by Confederates 1862; passed by two out of nine Union vessels March 14, 1863; vainly attacked, with heavy loss, May 27 and June 14. After a siege, it surrendered July 9, 1863. Pop., 1890, 250.

Port Huron. Capital of St. Clair co., Mich.; at the foot of Lake Huron; founded 1686, chartered 1857. Pop., 1890, 13,543.

Portico. In Classic Architecture, the space in front of a temple, together with the order of columns and entablature by which it was inclosed.

Portillo, JACINTO DE, 1490–1566. Spanish explorer in Mexico.

Portland. Largest city of Me., capital of Cumberland co.; important seaport, on a peninsula projecting into Casco Bay; founded 1632, chartered 1786 and 1832. It has a deep, capacious and well-sheltered harbor, and is an important railroad center. Pop., 1890, 36,425.

Portland. Capital of Multnomah co. and largest city of Oregon: on the w. bank of the Willamette, 12 m. above its mouth, on tidal and navigable water, founded 1845, chartered 1851. Pop., 1890, 46,385, since increased by the addition of suburbs.

Portland, Oregon.

Portland, ISLE OF. Peninsula of Dorsetshire, on the English Channel, ab. 4½ m. by 1½; noted for its stone-quarries, its prison, and three castles. Pop., 1891, 11,000.

Portland Cement. See CEMENT and CEMENT TESTS.

Portland Vase. See GLASS, ANCIENT.

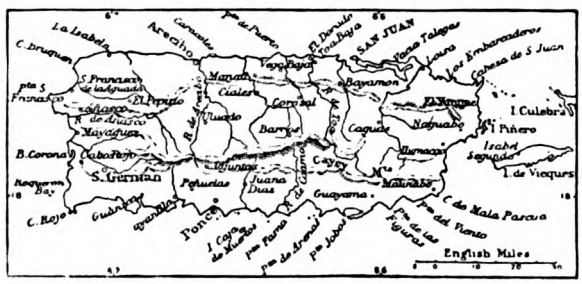
Port Louis. British capital and chief port of Mauritius, on n.w. coast. Pop., 1891, 62,046.

Port Mahon. Capital of Minorca, on s.e. coast; held 1708–56 and 1762–82 by the British, who fortified it. Pop. ab. 18,500.

Porto Alegre. City of s. Brazil, on the Jacuhy; settled 1742. Pop. ab. 40,000.

Portocarrero Laso de la Vega, MELCHOR DE, COUNT OF MANDEVA, 1636–1705. Spanish Lieut.-gen. 1666; Viceroy of Mexico 1686, and of Peru from 1689.

Porto Rico, or PUERTO RICO. One of the Spanish West India Islands, discovered by Columbus 1493; e. of Hayti; 90 m. by 36; area 3,530 sq. m. In 1510 Ponce de Leon founded the town of Caparra. The native inhabitants were soon subdued



Porto Rico.

and swept away. In 1820 a futile effort toward independence was made. Slavery was abolished in 1873. Some reforms were promised 1896–97. Pop., 1888, 813,937.

Portraits, COMPOSITE. Method of indicating the facial characteristics of a family or group of persons, but suppressing the individual peculiarities. The results are of considerable use in anthropology. They are obtained by superprinting the photographic negatives with slight exposure. A composite negative can be obtained from a succession of positives.

Portraiture. Portrait-statues of the third dynasty, 4449 B.C., have been found in Egypt. Apelles painted a portrait of Alexander the Great 4th century B.C.; there is no later record of portrait painting in Greece. From the Renaissance down to the present time both painters and sculptors have given great attention to portraiture, throughout Europe and in the U. S. The invention of photography doubtless diminished the demands for portraits by painting and sculpture.

Port Republic. In Rockingham co., Va.; scene of an engagement June 9, 1862.

Port-Royal. Abbey of Cistercian nuns, near Paris, founded 1204; center of the great Jansenist movement 1640–1700. For this cause it was much persecuted, lost control of its Parisian branch 1667, was excommunicated 1707, and destroyed 1709–10.

Port Royal. Village of Beaufort co., S. C., taken by Union forces Nov. 7, 1861. Pop., 1890, 524.

Port Said. Town of Egypt, on the Suez Canal; founded 1860, chiefly as a coaling station. Pop. ab. 21,000.

Portsmouth. Capital of Scioto co., Ohio; on the Ohio, at the mouth of the Scioto. Pop., 1890, 12,394.

Portsmouth. Capital of Norfolk co., Va.; on the Elizabeth, opposite Norfolk; site of a U. S. navy-yard. Pop., 1890, 13,268.

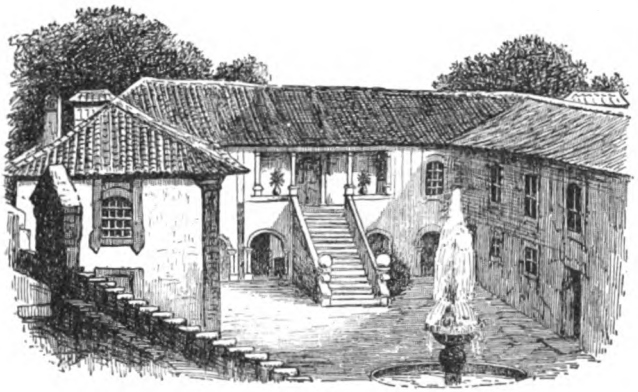
Portsmouth. City of Rockingham co., N. H.; on the Piscataqua, 3 m. from the sea; founded 1623, chartered 1849. It has considerable commerce. Pop., 1890, 9,827. U. S. navy-yard is on an island near by, belonging to Kittery, Me.

Portsmouth. Seaport town of s. England, on the Channel, 23 m. s.e. of Southampton. It is a very important naval station, with a fine harbor. Its fortifications were partly removed 1872. Pop., 1891, 159,255.

Portsmouth, DUCHESS OF, 1649–1734. Louise Renée de Keroualle, French mistress of Charles II.; ennobled 1673.

Portugal. Kingdom of s.w. Europe, occupying with Spain the Iberian peninsula. Its surface is mainly a somewhat elevated plateau, capped by mountain ranges. The area is 35,541 sq. m. Agriculture and manufactures are in a somewhat backward condition. The greatest attention is paid to the cultivation of the vine. The government is a limited monarchy. The capital is Lisbon. The original inhabitants were Celts and Iberians. It became a Roman province 200 B.C. as Lusitania, was conquered by Visigoths in the 5th century, by Moors in the 8th, and by Alfonso V. of Leon and Castile 1095, whose grandson Alfonso erected it into a kingdom 1139. It attained its culmination in the 14th and 15th centuries by means of its colonies; Lisbon was then the center of the world's commerce. It degenerated under Jesuit influences, and met with misfortunes; was united to Spain 1580; conquered its independence 1640 under the Braganzas. In the Napoleonic era it was partitioned, and the royal family fled to Brazil 1807. It was governed by a regency under English influence 1807–21, when John VI. returned, subverted the constitution, and began a reign of

terror. He was defeated and expelled by his brother, Dom Pedro of Brazil; Maria II. became Queen 1834; her son Luis



Country House in Portugal.

ascended the throne 1861. A peaceful constitutional development has begun.

Portuguese. See ROMANCE LANGUAGES.

Portuguese Man-of-War. A siphonophore. See PHYSALIDÆ.

Portulacaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 18 genera and 175 species of herbs, widely distributed throughout all parts of the earth; called the Purslane family.

Port Wine. Portuguese red wine, made from grapes grown on the mountain slopes on the river Douro. It becomes brown by age, but is artificially colored by elderberries and strengthened by brandy during fermentation and afterward. It contains 20–23 per cent alcohol, sugar 16–34 grs. per oz., and acid 3.6–5 grs. per oz., tartaric standard. The first port was shipped in 1678. The annual production is about 14,000,000 gals., of which about 6,000,000 gals. are exported, chiefly to Great Britain.

Porus. Indian king e. of the Hydaspes; conquered by Alexander 327 B.C.

Posadas, GERVASIO ANTONIO, 1757–1832. Director or dictator of Argentina 1814–15.

Pöschl, THOMAS, 1769–1837. Austrian heresiarch, founder of a fanatical and short-lived sect.

Poseidon. Greek god of the Mediterranean sea, son of Cronos and Rhea, brother of Zeus and Hades; dwelling under the Ægean and riding the sea in a car drawn by horses with golden manes; enemy to Troy; creator of the horse and patron of horse-races. Games in his honor were held on the isthmus of Corinth. His symbols are the dolphin, horse, and trident. See NEPTUNE.

Posen. Part of Poland till 1772, when the territory n. of the Netze was given to Prussia; the remainder was added 1793–95 as S. Prussia. It became part of duchy of Warsaw 1807, but was restored to Prussia 1815. A rebellion of the Poles was suppressed 1848. Its capital, P., on the Warthe, 158 m. e. of Berlin, is strongly fortified. Pop., 1890, 69,627.

Posepny, FRANZ, 1836–1895. Mining geologist; prof. in the mining school at Przibram, Bohemia. *Archiv fur praktische Geologie*, 1880–1895.

Posey, THOMAS, 1750–1818. Va. officer, repeatedly distinguished 1777–82; Brig.-gen. under Wayne 1793–94; Lieut.-gov. of Ky. 1805–6; Major-gen. 1809; U. S. Senator from La. 1812–13; Gov. of Indiana 1813–16.

Posidonia. See PÆSTUM.

Posidonius, 128–45 B.C. Syrian Stoic, teacher at Rhodes; envoy to Rome 86 B.C. His history continuing that of Polybius extended 145–82 B.C., and, like his other works, exists only in fragments.

Position. Method of solving problems by assuming values for the unknowns. Its forms, single and double, refer to the number of assumed values.

Position Angle. Angle which the line joining two stars, as seen projected on the celestial sphere, forms with the hour circle passing through the larger one.

Positions, MILITARY. Character depends on whether the defense is to be passive or active. If passive, its front should be covered by such obstacles as would break up or impede the advance of the enemy in any regular formation, and still allow the infantry and artillery fire of the troops in position to be efficacious; its occupied lines should be free from enfilade and their flanks secure; its lines of retreat free and ample. If the defense be active, the troops should be available for a counter-attack at a favorable moment; hence the front should be free from obstacles, well swept by fire, proportioned in extent to the strength of the occupying force, strengthened by natural or temporary points of support, ample means of communication from flank to flank, and good cover in rear for the supports, reserves, and supplies. The ground in rear should also afford good subsidiary positions for defense in case of defeat.

Positive Crystal. See CRYSTALS.

Positive Eyepiece of Telescope. Formed from two plane convex lenses, the convex surfaces facing each other; the focal image lies outside the eyepiece.

Positive Law. Distinguished from natural law; definite establishment of certain laws, expressly declared and really enforced in any given society.

Positive Quantities. Those having the plus sign; opposed to negative.

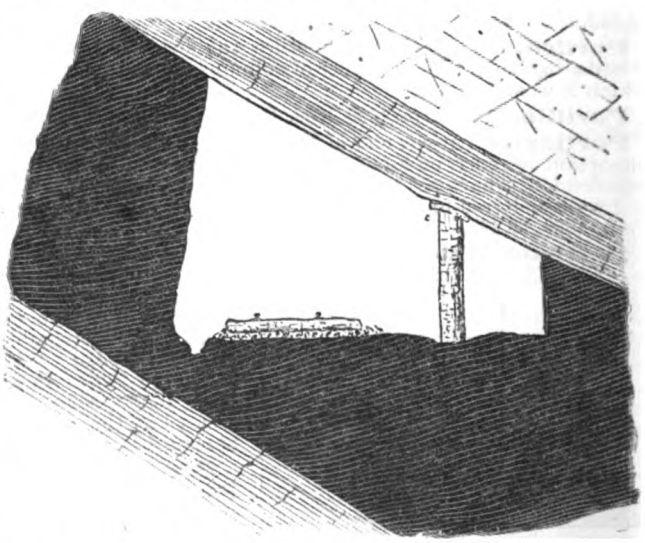
Positivism. Doctrine developed 1830–57 by COMTE (q.v.), that human progress has passed through three stages, theological, metaphysical, and positive, in which knowledge is limited to phenomena, excluding access to the nature of things. In principle the doctrine does not differ from skepticism or agnosticism.

Posse-Comitatus. Power of the county, consisting in Britain of every person above 15 years old, except peers and clergymen; in the U.S., generally of all male inhabitants. It may be called to his assistance by a peace officer in the execution of the laws.

Possession. Control or custody of a thing; detention of anything as one's own, and for enjoyment; occupation, actual or constructive, of subjects of property.

Posset. Dietetic preparation made by curdling milk with rennet, beer, wine, or any acid. It is used for coughs and colds.

Post. In Mining, (1) nearly equivalent to pillar; (2) artificial prop set to support rock that would be likely to fall.



When gangways are driven in thin seams, with a fairly good roof, the coal above the gangway being self-supporting, a post, as shown in the figure, is used to support the roof.

Post, or POST-OFFICE. Children's game played by any number, in which one acts as postman. The letters are given in the form of kisses.

Post, SLEEPING ON. Grave military crime, the punishment for which is death, or such other punishment as a court-martial may direct.

Post, WRIGHT, M D., 1766–1828. Prof. Columbia 1792–1813; eminent as an operating and consulting surgeon.—His nephew, ALBERT CHARLES, M.D., LL.D., 1806–1886, was Prof. of Surgery in Univ. New York 1851–75, and of much fame as a practitioner.

Post-Abdomen. See ABDOMEN.

Postage Stamps, INVENTION OF. The adhesive postage stamp was invented not by Sir R. Hill, but by James Chalmers of Dundee 1834. The plan of the impressed stamp as proposed by Rowland Hill not finding favor, when the Penny Postage Bill was introduced into Parliament, that of the ad-

hesive stamp previously sent by Chalmers was adopted by Treasury Minute dated 26th of December, 1839.

Postal Union. Arrangement between the various countries of Europe and the U.S., agreed upon at Berne Oct. 1874, which went into effect July 1, 1875; designed to secure uniformity in postal matters, reduce rates, simplify accounts, etc. It now embraces nearly every country in the world. The central office is at Berne. Uniform rate on prepaid letters of ½ oz., 5 cts.; postal cards, 2 cts. Matter mailed in the U.S. for Canada or Mexico pays only U.S. postage.

Post-anal Gut. That portion of the neurenteric canal which lies nearest the anus and beneath the notochord.

Post-anal Vesicle. Small globular sac, close to where the anus appears in fish embyros. It represents a portion of the post-anal gut, and as such the archenteric cavity of other forms. It communicates on the one hand with the blastopore, and on the other opens into the neural cavity.

Post and Stall. Method of coal mining essentially like that of pillar and stall.

Poste Restante. Department of a post-office in which letters are kept until called for, if so addressed.

Postern. Properly a small opening for entrance and exit in the wall of a castle or fortified dwelling, but used also for subordinate entrances in other buildings.

Posticum. Portico at the rear of a temple.

Posting. Method of forwarding passengers by means of relays of horses. Still practiced in some parts of Europe and Asia.

Postliminy. Right, by Roman law, to be restored to one's former status and property, upon being recaptured from the enemy. Modern international law secures to the owner the possession of goods upon their prompt recapture.

Post Mortem Examination. Section of a body after death to examine the condition of the internal organs. It is useful as an aid to determine the cause of obscure symptoms arising in the disease and in determining the cause of death when there is a legal investigation.

Post-Obit. Bond executed by a person on the receipt of money from another, whereby the borrower binds himself to pay to the lender the sum so received, generally with high interest, upon the death of a person from whom the borrower expects to inherit property.

Post-Office. Posts, or relays of mounted men, stationed at convenient distances, were maintained by Cyrus. Augustus had like means of communication with the remoter parts of the Empire; so had Charlemagne. The first letter-post was that established in the Hanse towns ab.1200. In England letters were sent by special messengers only; in 1635 a "post or two" was established between London and Edinburgh, which was to make the round trip in 6 days. In 1640, 8 main lines were set up in the kingdom. Mail coaches came 1784. Rowland Hill's scheme of penny postage (payable by stamps) went into operation Jan. 10, 1840, before which date a letter conveyed 15 miles or less paid 4*d.*; 300 miles or over, 12*d.* Halfpenny post cards were introduced Oct. 1870. Postal orders were first issued Jan. 1881. Postal savings banks date from 1861. The telegraphs came under the direction of the postal department Feb. 5, 1870. The franking privilege ceased 1840.

In 1672 New York and Boston could exchange letters once a month. From 1692 to 1710 Thomas Neale and his successors managed the postal affairs of N. America under the royal authority. The Continental Congress established post-routes from Falmouth, Me., to Savannah. In 1792 the postage rate was 6 cts. for 30 miles or less, for more than 450 miles 25 cts. In 1845 this became 5 cts. for ½ oz. any distance under 300 miles, over that distance, 10 cts. In 1851 the rate, if prepaid, was 3 cts. for less than 3,000 miles, and 6 cts. (10 cts. in 1855) for longer distances. In 1863 the uniform rate of 3 cts. per ½ oz. was adopted, in Oct. 1883 that of 2 cts., and in July 1, 1885, 2 cts. per oz. Postage stamps were introduced 1847; stamped envelopes 1852; free delivery 1863, extended to towns of over 10,000, 1887; money orders 1864; postal cards 1873; special delivery 1885. Number of post-offices, 1895, 70,064; aggregate length of post-routes, 456,026 miles; number of pieces transmitted about 3,800,000,000, at a cost of $86,790,172; receipts, $76,983,128.

Post-Office Savings Banks. System by which the Government receives small deposits of money at each of its local post-offices, holding them for the depositor, and allowing interest, in Great Britain 2½ per cent. They were established in Great Britain 1861, and in France 1881.

Post-Scutellum. Most posterior piece of the notum in the thoracic segments of insects.

Post-Tertiary. See QUATERNARY.

Postulate. Axiom or necessary assumption made preliminary to some investigation, and not itself investigated or determined as to its validity; assumption which conditions the progress of inquiry in any given department of thought.

Post-Zygapophysis. See ZYGAPOPHYSES.

Potamogalidæ. Family of *Insectivora*, including only the *Potamogale velox* of W. Africa, an otter-like amphibious animal with rudder-like tail and webbed feet. It is ab. 18 in. long, feeds on fish, and has teeth similar to those of the Golden Moles.

Potash. See POTASSIUM HYDROXIDE.

Potassium. K. At.wt. 39.11. sp. gr. .86, sp. ht. 0.25, mpt. 62.5° C., valence I.: discovered by Davy 1807; soft, silver-white metal of bright metallic luster when freshly cut. Heated, it is converted into a green vapor; thrown upon water, hydrogen is liberated and takes fire. It is rapidly oxidized in the air, so that it must be preserved in some neutral substance, like petroleum or benzene. It is found in nature in silicates, feldspar and mica; in sea water in the form of chlorides and sulphates, also as SYLVITE (q.v.) and in the ashes of plants. It is prepared by heating a mixture of potassium carbonate and carbon in an iron retort, the vapors being condensed in a cold receiver: $K_2CO_3 + 2C = 2K + 3CO$.

Potassium Acid Carbonate. $KHCO_3$. White solid, made by passing carbon dioxide into a solution of potassium carbonate. When heated it readily yields the normal carbonate.

Potassium Acid Sulphate. $KHSO_4$. Obtained by treating saltpeter with sulphuric acid. It occurs near Naples in the Grotto del Solfo. When heated it yields potassium pyrosulphate, $K_2S_2O_7$, and sulphur trioxide. It is often used for decomposing minerals.

Potassium Aluminate. $K_2Al_2O_4 + 3H_2O$. Hard crystals, soluble in water; obtained by fusing together aluminium trioxide and caustic potash, and crystallizing from water.

Potassium Aluminium Sulphate. $K_2SO_4.Al_2(SO_4)_3 + 24H_2O$. Alum. Potassium Alum. Found in nature in volcanic regions; made from ALUM SHALE (q.v.), which occurs in large quantities. It is soluble in water, crystallizes in octahedra, has a bitter, astringent taste, is used in medicine, by bakers, and as a mordant, for the preparation of pigments, sizing paper, clarifying water, etc.

Potassium Amide. KNH_2. Yellow or flesh-colored mass; mpt. above 100° C.; decomposed by water into ammonium and potassium hydroxides; made by fusing potassium in dry ammonia.

Potassium Arsenite. See FOWLER'S SOLUTION.

Potassium Auric Chloride. $KCl.AuCl_3 + 2H_2O$. Large, bright-yellow, transparent, rhombic tablets; made by adding a solution of auric chloride and one of potassium chloride in molecular proportion.

Potassium Bromate. $KBrO_3$. Hexagonal crystals, decomposing into oxygen and potassium bromide on heating; obtained as a by-product in the preparation of POTASSIUM BROMIDE (q.v.).

Potassium Bromide. KBr. White cubes, soluble in water and alcohol; made by warming bromine with caustic potash and igniting the residue with carbon; used in medicine and photography.

Potassium Carbonate. K_2CO_3. White, deliquescent crystals, very soluble in water: the solution has an alkaline reaction. It is the chief constituent of wood ashes, and was formerly obtained from this source. The impure salt is known as potash. It is made from the sulphate and chloride by the methods used for preparing SODIUM CARBONATE (q.v.).

Potassium Carbonyl. KCO. Reddish-white substance, exploding at 100° C.; decomposing in steam; made by passing carbon monoxide into a solution of potassium amide in liquefied ammonia at —50° C.

Potassium Chlorate. $KClO_3$. White, monoclinic crystals, soluble with difficulty in water; made by passing chlorine into a solution of calcium hydroxide containing an excess of the hydroxide, and treating the product with potassium carbonate; good oxidizing agent; used for making oxygen, explosives, safety-matches, fireworks, and in medicine for throat disorders.

Potassium Chloride. KCl. Found in nature as SYLVITE and CARNALLITE (q.v.); made by treating caustic potash with hydrochloric acid; soluble in water, insoluble in alcohol.

Potassium Chromate. K_2CrO_4. Yellow crystals, soluble in water; made by heating chrome iron ore with solid caustic potash. Acids convert it into potassium dichromate.

Potassium Chromium Sulphate. See CHROME-ALUM.

Potassium Cyanide. KCN. White, deliquescent, easily fusible mass; extremely poisonous; made by heating potassium

ferrocyanide with potassium carbonate; used in photography and electroplating.

Potassium Dichromate. $K_2Cr_2O_7$. Red, triclinic plates, soluble in water; excellent oxidizing agent; made from the chromate; used in photography, dyeing, and for battery solutions.

Potassium Disulphide. K_2S_2. Pomegranate-yellow or reddish-yellow, crystalline, easily fusible substance, formed by allowing an alcoholic solution of potassium sulphydrate to stand exposed to the air. It oxidizes on standing in air to potassium thiosulphate.

Potassium Ferricyanide, or RED PRUSSIATE OF POTASH. $K_3Fe(CN)_6$. Dark-red, monoclinic prisms, soluble in water; excellent oxidizing agent. Added to the solution of a ferrous salt, it gives a dark blue precipitate, Turnbull's Blue, $Fe_3(Fe(CN)_6)_2$. It does not cause precipitation in ferric solutions.

Potassium Ferrocyanide. $K_4Fe(CN)_6+3H_2O$. Yellow prussiate of potash; large, yellow, tetragonal pyramids, soluble in water; made by melting crude potash, iron filings, and refuse animal-matter, horns, hoofs, hair, etc. Added to a ferric salt, it gives a dark blue precipitate, Prussian Blue, $Fe_4(Fe(CN)_6)_3$.

Potassium Fluoride. KFl. Substance with an alkaline reaction and salty taste, made by neutralizing hydrofluoric acid with potassium carbonate in a platinum vessel.

Potassium Fluosilicate. K_2SiFl_6. Translucent, iridescent, gelatinous substance, formed by adding hydrofluosilicic acid to a potassium compound.

Potassium Hydride. K_2H. Silver-white mass, spontaneously inflammable; made by heating potassium in an atmosphere of hydrogen to 300° C.

Potassium Hydrogen Sulphite. $KHSO_3$. Small, monoclinic crystals, decomposing at 190° C.; soluble in water; made by supersaturating a concentrated solution of potassium carbonate with sulphur dioxide and mixing it with absolute alcohol.

Potassium Hydrosulphide. KSH. White substance, oxidizing readily in the air; made by treating potassium hydroxide with hydrogen sulphide.

Potassium Hydroxide, or CAUSTIC POTASH. KOH. White, brittle, deliquescent substance, strongest of the bases, disintegrating animal tissues; made by heating lime and potassium carbonate in silver or iron vessels. It usually contains impurities, but is obtained in a pure form by dissolving in alcohol, filtering and evaporating. It is used in making soft-soap, and in the laboratory.

Potassium Hypophosphite. KH_2PO_2. Extremely deliquescent, hexagonal tablets, soluble in dilute alcohol and water; made by boiling phosphorus in an aqueous or alcoholic solution of caustic potash.

Potassium Iodate. KIO_3. Small, hard, regular crystals; mpt. 560° C.; soluble in water; obtained as a by-product in the manufacture of potassium iodide from iodine and caustic potash.

Potassium Iodide. KI. White crystals; mpt. 634° C.; soluble in water. The water solution is a good solvent for iodine. It is made by bringing iron filings and iodine together, and treating the product with potassium carbonate, and is used in photography and medicine.

Potassium Manganate. K_2MnO_4. Dark-green mass, made by fusing manganese dioxide with caustic potash and potassium chlorate. It changes readily to potassium permanganate.

Potassium Nitrate, SALTPETER, or NITER. KNO_3. White rhombic prisms or rhombohedra, dissolving in water with lowering of temperature. Much of it comes from the Bengalese saltpeter plantations on the upper Ganges River. The ground is watered at night, and in the morning the water brings the saltpeter to the surface, from which it is scraped off. This niter earth contains 12 per cent of potassium and calcium nitrates, from which the niter is obtained by solution in water, with wood-ashes, and crystallization. It is made also by treating Chili saltpeter, sodium nitrate, with potassium chloride. It is used in the laboratory as an oxidizing agent, in the arts, and in the manufacture of fireworks and gunpowder. See NITER.

Potassium Nitride. K_3N. Greenish-black, infusible mass, burning in the air with a dark red flame; decomposed by water into caustic potash and ammonia; made by passing dry ammonia over heated potassium amide.

Potassium Nitrite. KNO_2. White crystallized compound, formed by heating potassium nitrate; used in the laboratory as a source of nitrous fumes.

Potassium Oxide. K_2O. White mass, made by heating potassium in the air; extremely soluble in water, forming potassium hydroxide. A peroxide, K_2O_4, is also known.

Potassium Perbromate. Similiar to POTASSIUM PERCHLORATE (q.v.).

Potassium Pentasulphide. K_2S_5. Red or yellow, hygroscopic, fusible substance, unstable above 600° C.; soluble in water and alcohol; made by heating a mixture of potassium carbonate and sulphur in dry hydrogen sulphide.

Potassium Perchlorate. $KClO_4$. Transparent, rhombic crystals, isomorphous with the corresponding ammonium salt. It has a slight cooling, salty taste, and is slowly soluble in water. At 400° C. it decomposes into potassium chlorate and oxygen. It is made by neutralizing perchloric acid with potassium carbonate, and is used as an oxidizing agent.

Potassium Permanganate. $KMnO_4$. Dark-purple crystals, made by oxidizing manganese dioxide in presence of a base; soluble in water: the solution is a good disinfectant. It is used extensively as an oxidizing agent.

Potassium Phosphate. K_3PO_4. Small crystals, easily soluble in water; made by fusing phosphoric acid with potassium carbonate.

Potassium Phosphite. K_3PO_3. Thick, syrup-like mass, containing small crystals; obtained by neutralizing phosphorous acid with caustic potash and evaporating in a vacuum.

Potassium Polysulphides. See POTASSIUM SULPHIDE.

Potassium Stannate. K_2SnO_3. Colorless, lustrous monoclinic columns or rhombohedra, containing 3 molecules of water; soluble in water; made by fusing tin dioxide with potassium carbonate.

Potassium Subchloride. K_2Cl. Dark-blue substance, made by fusing potassium with potassium chloride in a stream of hydrogen.

Potassium Sulphate. K_2SO_4. White crystals, found in nature in combination with other salts (see KAINITE). It is made by treating potassium carbonate or hydroxide with sulphuric acid, and is used in medicine and in the preparation of alum.

Potassium Sulphide. K_2S. It crystallizes from water with $5H_2O$, in colorless prisms; the solution absorbs oxygen. It is made by heating potassium sulphate with carbon, and has the power of taking up more sulphur, forming the polysulphides of the formulæ, K_2S_2, K_2S_3, K_2S_4, and K_2S_5.

Potassium Sulphite. K_2SO_3. Small hexagonal prisms, less soluble in hot than in cold water. The dilute solution oxidizes readily to the sulphate. It is made by passing sulphur dioxide into caustic potash, and also occurs with one or two molecules of water of crystallization.

Potassium Sulphocyanate. KCNS. Mpt. 161° C. It crystallizes in columns or needles, and is soluble in water. It is made by fusing together potassium ferrocyanide, carbonate, and sulphur, and is used as a test for ferric compounds, with which it forms a deep red color.

Potassium Tellurate. K_2TeO_4. Made by heating tellurium with potassium carbonate and nitrate; used for making TELLURIC ACID (q.v.).

Potassium Tetrachromate. $K_2Cr_4O_{13}$. Mpt. 215° C. Brownish-red crusts, consisting of rhombic tablets; made by dissolving the dichromate in nitric acid, sp. gr. 1.41.

Potassium Tetrasulphide. K_2S_4. Hyacinthine, translucent, unstable substance, made by boiling a mixture of potassium sulphide, sulphur, and water, and heating the residue in a stream of hydrogen.

Potassium Tetroxide. K_2O_4. Amorphous, soluble, yellow powder. It softens at 280° C., fuses at a red heat to a black transparent liquid; decomposes in moist air with the evolution of oxygen, and is made by heating potassium in the air, nitrous or nitric oxide from 60° to 80° C.

Potassium Trichromate. $K_2Cr_3O_{10}$. Mpt. 250° C. Deep-red, monoclinic prisms; made by treating the dichromate with nitric acid, sp. gr. 1.19.

Potassium Trisulphide. K_2S_3. Yellowish-brown, crystalline solid, becoming black on fusing; stable at a red heat, soluble in water; made by heating 4 molecules potassium carbonate with 10 atoms sulphur.

Potassium Tungstate. $K_2WO_4+2H_2O$. It also occurs

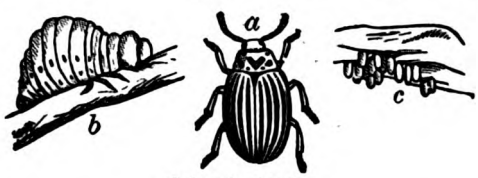
in the anhydrous form, and is made by fusing the trioxide with potassium carbonate. Several more complex potassium salts are known; *e.g.*, $K_{10}W_{12}O_{41}+11H_2O$.

Potassoxyl. Radical OK.

Potato. *Solanum tuberosum.* Herb of the natural family *Solanaceæ*, native of w. America, universally cultivated for its farinaceous tubers. The soil best suited for potatoes is a sandy or gravelly one that either is naturally rich or has been made so. Potatoes usually respond well to potash fertilizers, and it is thought that coarse farmyard manure is a great cause of the potato scab. Propagation is by the tubers, either whole or cut, and cultivation is essentially like Indian corn. Potatoes suffer from the attacks of a fungus that causes the leaves to blight and the tubers to rot.

Potato, SWEET. See SWEET POTATO.

Potato Beetle, COLORADO (DORYPHORA DECEMLINEATA). First brought to notice 1859, it had spread over the country by 1874. The larvæ are short, plump, and reddish, with black head and two rows of black spots on the sides. They are very voracious, and usually attack potatoes in preference to all other plants. The adults have each wing cover marked with five longitudinal black stripes. The female lays about a thousand eggs in clusters on the lower side of leaves. They hatch in a week, and are ready to turn into the winged and sexed form two weeks later. They are held in check by frequent dusting of the potato plants with plaster mixed with Paris green. The bogus potato beetle (which, however, does not feed on the potato plant) differs from the genuine potato beetle in that the larvæ have but one row of black spots on each side.



Colorado Beetle:

a, beetle, natural size; *b*, caterpillar; *c*, eggs.

Potato Bug. Name applied to a great many different insects by farmers. See POTATO BEETLE.

Potato-Vine, WILD. See MAN-OF-THE-EARTH.

Potekhin, ALEXSEI, b.1829. Russian novelist and dramatist, dealing chiefly with low life. *The Peasant Woman; For Money; Young Inclinations*, 1879; *Village Leeches*, 1880.

Potemkin, GREGOIRE ALEXANDROVITCH, 1736–1791. Courtier and minister of Catherine II. of Russia; all-powerful at home from 1776, and greatly regarded abroad.

Potential (GRAVITATION). The potential at any point in space due to the presence of any system of masses whatever is equal to the number of units of work which must be done upon one unit of mass against the acting forces in moving it to the boundary of the field of force. Thus potential in the case of attraction is negative. It is clear that in general the potential at a point is equal in quantity to the potential energy of a unit mass placed there.

ELECTRICAL.—Amount of work that must be done upon one unit of electricity in carrying it from the point in question to the boundary of the electrical field.

MAGNETIC.—Amount of work that must be done upon a unit magnetic pole in carrying it from the point in question to the boundary of the magnetic field. In general the "difference of potential" between two points is equal to the work that must be done in carrying a unit mass, a unit of electricity, or a unit magnetic pole, as the case may be, from one point to the other by any path. The locus of all the points in a field at which the potential has the same value is called an EQUIPOTENTIAL SURFACE (q.v.). These surfaces are always perpendicular to the lines of force at every point.

Potential Capital. All things which are capable of being used to promote production, in distinction from actual capital, which should include only those things really so applied.

Potential Function. If we imagine an attracting body M to be divided into small elements, and add together all the fractions formed by taking the ratio of the mass of each element to its distance to a given point P in space, the limit of this sum, as the elements are made smaller and smaller, is called the value at P of the potential function due to M; or

$$V = \underset{\Delta m = o}{\text{limit.}} \sum \frac{\Delta m}{r}.$$

If the co-ordinates of P be (x, y, z), and those of an element (x^1, y^1, z^1), then

$$V = \int\int\int \frac{\rho\, dx^1\, dy^1\, dz^1}{[(x^1-x)^2 + (y^1-y)^2 + (z^1-z)^2]^{\frac{1}{2}}}$$

where ρ is the density at the point (x^1, y^1, z^1), and where the integration is to include the whole of the mass M. If we differentiate V twice with regard to x, y, and z, with the understanding that P is not within the mass M, and add the results together, we shall obtain

$$D_x^2V + D_y^2V + D_z^2V = 0$$

which is Laplace's Equation. The operator ($D_x^2 + D_y^2 + D_z^2$) is sometimes denoted by the symbol ∇^2, so that we may write LAPLACE'S EQUATION (q.v.) in the form $\nabla^2 V = 0$. If P be within the attracting matter M,

$$\nabla^2 V = -4\pi\rho$$

which is POISSON'S EQUATION (q.v.).

Potential Temperature. That which would be assumed by a mass of moist gas if reduced adiabatically to any adopted standard pressure.

Potgieter, EVERHARD JOHANNES, 1803–1875. Dutch writer; ed. *De Gids* 1837–67.

Pot-Herbs. Plants that are used chiefly for flavoring, as fennel and parsley.

Pothier, ROBERT JOSEPH, 1699–1772. Prof. of Law at Orleans from 1749. *Traité des Obligations*, 1768.

Pot-Hole. Vertical, cylindrical cavity in rocks, made by the gyratory motion of a current of water, the cutting being done by stones and sand. Pot-holes over 60 feet deep have been recorded. The pool found beneath a cataract is closely related to a pot-hole.

Poti. Russian fortress in the Transcaucasia, at the mouth of the Rion. It is very unhealthy on account of surrounding marshes. It commands the shore route between Russia and Persia.

Pot-Metal. Alloys of copper and lead of varying proportions.

Potomac. River heading in n. W. Va. in several large branches, flowing n.e., e., and finally s.e. into Chesapeake Bay, forming the boundary between Md. and Dist. of Columbia on the n. and Va. and W. Va. on the s.; navigable to Georgetown, D. C. Drainage area 14,479 sq. m., length ab. 400 m.

Potosi. City of Bolivia, on the Cordilleras, 13,000 ft. above the sea; famous since 1546 for its silver mines, now little worked, the ore lying too deep. Pop. ab. 12.000.

Pot-Pourri. Miscellaneous mixture. French equivalent for the OLLA PODRIDA (q.v.) of the Spaniards; also, mixture of dried flowers, spices, etc., placed in a vase with perforated cover, and used for scenting the air of rooms.

Potsdam. City of Prussia, on an island in the Havel, 17 m. s.w. of Berlin; founded 1673; noted for its palaces. Before the time of Frederick II. it was only known as a fishing village, and this place and the entire surroundings are a monument of his taste and splendor. Pop., 1890, 54,125.

Potsdam, Residence of the Emperor of Germany.

Potstone. Greenish, or dark-colored, impure soapstone, or other chloritic magnesian rock, that, owing to its softness, can be easily cut into the shape of various utensils.

Pott, AUGUST FRIEDRICH, 1802–1887. Prof. Halle 1833; fa-

mous for his investigations in Comparative Philology. *Etym. Forschungen*, 1833–76.

Pott, FRANCIS, b. 1832. English hymnist and translator.

Pott, PERCIVAL, 1713–1788. Surgeon to St. Bartholomew's Hospital, London, 1749–87; student of spinal diseases; professional writer.

Pottawatomies. Algonquin Indian tribe of Wisconsin, living near Green Bay ab.1700, but moved to a region s. of Chicago. They number now ab. 2,000, most being in Indian Territory. Black Hawk, chief of the Sacs and Foxes, was a Pottawatomie by birth.

Potter, ALONZO, D.D., LL.D., 1800–1865. Prof. Union Coll. 1831–45; Bp. of Pa. from 1845; of eminent executive ability.—His son, HENRY CODMAN, D.D., LL.D., D.C.L., b. 1835, was Rector of Grace Ch., New York, 1868; Asst. Bp. of N. Y. 1883, Bp. 1887. *Sisterhoods*, 1871.—His brother, ELIPHALET NOTT, D.D., LL.D., b. 1836, was pres. of Union Coll. 1871–84; pres. Hobart Coll. 1884–96.—Alonzo's brother, HORATIO, D.D., LL.D., D.C.L., 1802–1887, was Bp. of N. Y. from 1861.

Potter, EDWARD C., b. 1860. American sculptor. Associated with D. C. French for the landscape decorative work in the Court of Honor at the World's Columbian Exposition, Chicago. All the animals of works otherwise by French, were by him; also the horses of the Columbus Quadriga on the Triumphal Arch of the Peristyle.

Potter, JOHN, D.D., 1674–1747. Bp. of Oxford 1715; Abp. of Canterbury 1737. *Archæologia Græca*, 1698.

Potter, PAUL, 1625–1654. Dutch animal-painter of great fame. The *Young Bull* at the Hague is among his most memorable works. See DUTCH SCHOOL.

Potter, WILLIAM JAMES, 1830–1893. Long Unitarian pastor at New Bedford, Mass.; sec. Free Religious Association 1867–82, pres. from 1882; ed. *Index* 1880–87.

Potter's Clay. See CLAY.

Pottery. This ancient and universal art includes all objects made of clay to which a certain consistency is given by burning. The clays are plastic and can be molded into any form. Circular objects are formed upon the potter's wheel, which was invented in Egypt earlier than 4000 B.C. This consists of a wooden disk upon an upright shaft in a table, the lower end having a large disk which is turned by the foot or other power. The clay, freed from coarse particles and rendered plastic by kneading with water in a pug mill, is shaped by the hands or in a mold of plaster of Paris, revolving with the wheel. Articles of irregular form are made in similar molds, which are sectional and can be removed from the article. The plastic clay is flattened into sheets and laid around the interior of the mold. Another method is by casting, the clay being suspended in water and poured into the mold; after standing some time, the liquid is poured out, and some of the clay adheres to the mold, the plaster of Paris absorbing some of the water; the operation is repeated until sufficient thickness is attained. The molds with their contents, as well as the articles made without molds, are somewhat dried in a warm room, and then finished by hand with knives to remove rough edges. The ware is then baked in kilns of various forms, which render it hard and sonorous. Such ware is porous; if it is desired to be water tight, a glaze is formed on the ware, the simplest method being to throw salt into the fireplace of the kiln, when it is volatilized and glazes the ware, forming a sodium silicate with the aluminium silicate of the ware. Ordinary stoneware jugs are thus glazed. For finer ware, the baked articles are dipped into a pulverized glaze suspended in water, a portion of which adheres to the ware and is fused by rebaking. The glaze is made of feldspar, quartz, chalk, and borax, white or red lead; the mixture is fused and ground. The finest ware is PORCELAIN (q.v.).

The English Iron-stone China is composed of kaolin, 10 parts, plastic clay and flint each 20 and calcined bones 50. The glaze is similar to that last mentioned. The ware is baked in earthen pots in kilns, which requires two days, and cooling one day; the glaze is baked at a lower temperature and in less time. Colors for this ware are metallic oxides with borax applied upon the glaze and fused in a muffle. Most of the English table ware is of this variety.

Stoneware is made of kaolin, plastic clay, feldspar and quartz, the last two constituting one-half. Blue tint is given by cobalt oxide and green by chromium sesquioxide. It is glazed by salt or as with the iron-stone china.

Ordinary Stoneware is made of plastic clay with sand or cement, and is baked in long furnaces, requiring five days.

Earthenware is made of plastic clay, quartz and feldspar. Wedgewood ware has cobalt oxide for a blue tint. It is lead glazed and is twice fired. Luster ware is made by glazing with metallic solutions and heating in a muffle. Painting is applied with the glaze. Delft and Faience belong here, and the colors are laid on with the glaze.

Common Earthenware uses poorer materials, and ordinary pottery is made of potters' clay and sand with an aluminous lead glaze, the baking requiring 12 hours. Common pottery is made of ordinary clay mixed with sand and glazed with red lead; it is baked at one firing in 36 hours.

Bricks are formed by hand or by machinery and baked for four days; the red color is due to Fe_2O_3. Fire-bricks are made of fire clay and sand and require eight days for burning. Crucibles are made of similar materials. Plumbago crucibles contain fire clay with 12 per cent plumbago. See BRICKS, TERRA-COTTA, TILES, PUG-MILL.

Pottinger, SIR HENRY, 1789–1854. Irish diplomatist, in India 1804–39; Baronet 1839; Envoy to China 1841–43; Gov. of Madras from 1847.

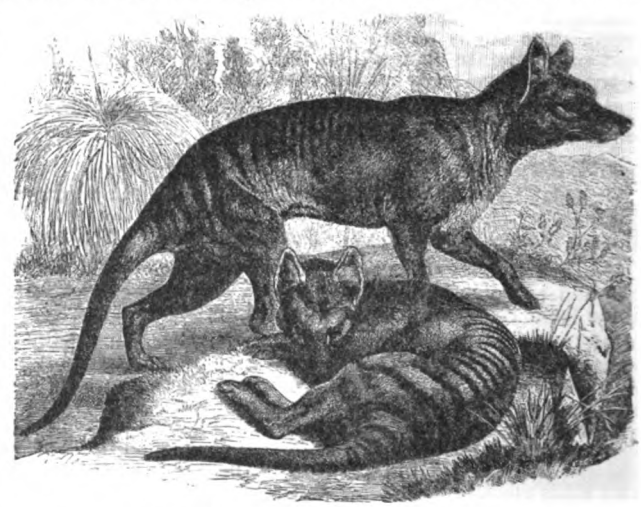
Pott's Disease. Disease of the spinal column, usually of tuberculous origin. There is an inflammation of the bone resulting in caries, followed by curvature of the spine directly backward. The disease attacks quite young children, and is a cause of hunchback.

Pottstown. Borough of Montgomery co., Pa., on the Schuylkill, 18 m. e. of Reading. Its chief industries are iron mills. Pop., 1890, 13,285.

Pottsville. Capital of Schuylkill co., Pa., near the headwaters of the Schuylkill, in an anthracite region. Its main business is the mining and shipping of coal. Pop., 1890, 14,117.

Pottsville. Great basal conglomerate of the Coal Measures in Pa. Extending into other States, this has received other names, some of which relate to the whole and others to the different strata into which it divides. It is the equivalent of the English Millstone Grit.

Pouched Dog (THYLACINUS; ZEBRA-WOLF). Marsupial of Tasmania, resembling a wolf, but with a dozen black bars



Pouched Dog (*Thylacinus cynocephalus*).

across the back and rump. It attacks sheep, and is active only at night. The pouch is rudimentary in the male.

Poughkeepsie. Capital of Dutchess co., N. Y., on the e. bank of the Hudson; settled ab.1705; site of Vassar College. Here the Articles of Confederation were ratified by N. Y. 1778, and the U. S. Constitution 1788. Pop., 1890, 22,206.

Pouillet Pyrheliometer. Black bulb thermometer immersed in a small glass of water retained in a vessel whose inside is also blackened. The water is kept well stirred; a change of temperature of the water is measured when the sunlight is admitted and cut off.

Poultice. Mixture of certain substances, *e.g.*, the powdered bark of the slippery elm, into a mush-like mass for the purpose of applying heat and moisture to a part. Caution is required in the use of poultices, especially on suppurating surfaces, as they afford an excellent soil for the multiplication of the bacteria of suppuration and prevent an aseptic condition of the sore.

Poultry. Over a hundred varieties of Chickens are known, belonging to several races, of which the chief are: Games, Cochins, Spanish, Hamburghs, Bantams, Crested Fowls. They are believed to have descended from a single wild species, the Red Jungle Fowl (*Gallus bankwa*) of the mountains of n. India.

This was domesticated in e. Asia before 1500 B.C. In rearing fowls for eggs or breeding they should run as much as possible in a large, wooded place; but if raised simply for food (as in rearing "broilers"), incubators, close quarters, artificial food, and heat are successfully employed. The food should be proteinaceous, and bad ventilation, dampness, and dirt avoided, otherwise they easily succumb to disease. See DUCKS, GEESE, GUINEA-FOWLS, TURKEYS, GALLINACEI, and PHASIANIDÆ.

Pounce. Formerly used to prevent blotting of ink, in place of blotting paper. It consisted of powdered rosin, gum resin, or cuttle-fish bones. Sand was also used.

Pound. Unit of weight in many countries, but differing in value. The avoirdupois pound was introduced into England by Henry VIII. The British standard of mass was defined 1826 by saying that one cubic inch of water at 62° F. contained 252.458 grains, while 7,000 grains make one pound. Later it was enacted by Parliament that the British standard pound should be the weight of a certain piece of platinum marked "P. S. 1844, 1 lb.," and kept in the office of the Exchequer. Its weight is 7,000 troy grains. This is denominated the Imperial Standard Pound Avoirdupois, and was verified by Prof. W. H. Miller. Several copies have been deposited in different places for reference in the event of accident to the original. It is the pound weight that has legal authority as a standard. The pound mass is the quantity of matter in the piece of platinum above defined. The troy pound weighs 5,760 grains, and is used in weighing gold and silver and by apothecaries in compounding medicines, which are sold by avoirdupois wt.

Pound. Inclosure for stray cattle, where they are kept until the owner claims them and pays the damages.

Pound (FORCE). Weight of one pound mass on the earth's surface at the level of the sea and in latitude 45° See FORCE.

Poundal. See FORCE.

Poundal-Second. See PULSE.

Pound-Celo. Unit of mass-acceleration. It is equal to the force that would have to be applied to the mass of one pound to give it an acceleration of one foot per second (1 celo).

Pounds, JOHN, d. 1839. Shoemaker of Portsmouth, Eng., originator of ragged schools ab. 1819.

Pound Sterling. In Great Britain twenty shillings; originally a pound weight of silver; now 66 shillings are coined from a pound, as under George I.

Pound-Velo. Unit of momentum. It is equal to the momentum of a mass of one pound moving with the velocity of one foot per second (1 velo).

Pourbus, FRANS, 16th cent. Flemish painters, father, 1545–1581, and son, 1570–1622. The latter is important as a mediator between Italian and Flemish art.

Pourtales, LOUIS FRANÇOIS DE, 1824–1880. Swiss-American naturalist, pupil of Agassiz, and his successor at the Cambridge Museum; on U. S. Coast Survey 1848–73, where he did valuable work in marine zoölogy and in introducing deep-sea dredging.

Poussin, NICOLAS, 1594–1665. French painter of landscape and classical subjects; greatest of his time next to Claude Lor-

Nicolas Poussin.

raine; long in Rome; distinguished for well-balanced composition; rather deficient in color.—His brother-in-law, GASPARD (DUGHET), 1613–1675, was a landscape painter of great power, active in Rome.

Pouter. Breed of pigeons with long, feathered legs, having the characteristic habit of puffing up the breast into globular shape.

Powder. Substances used to propel projectiles from guns, or to violently rend masses into smaller fragments. First used in Europe for guns in 14th century, in the form of powder or dust, whence its name. The early powder dust burned slowly and gave low pressures; it was followed by small grained powder whose great pressure limited the size of cannon. Rodman in 1860 varied the size of the grain to suit the caliber, and from this date great guns were possible. Powders are now made either from explosive mixtures or explosive compounds. In the first a combustible substance and a supporter of combustion are brought into extremely close contact by intimate mechanical mixture, as in gunpowder, where carbon, niter, and sulphur are mixed together. In an explosive compound the elements are all in chemical combination, presenting a definite explosive molecule, which contains both the combustible and the supporter of combustion. The chief explosive compounds are formed from some organic substance containing carbon, hydrogen, and oxygen, by introducing into it, through the action of concentrated nitric acid, a certain portion of nitric peroxide (NO_2) in substitution for an equivalent amount of hydrogen. GUNPOWDER, GUN COTTON, and NITROGLYCERIN (q.v.) are the principal explosive compounds. See SMOKELESS POWDERS.

Powderly, TERENCE VINCENT, b. 1849. Mayor of Scranton, Pa., 1878–84; master workman Knights of Labor 1879–94; Com. Immigration 1897.

Powder Magazine. Chamber to contain ammunition for the service of a battery of guns. For earthen batteries it is built of timber framework, its walls covered with earth thick enough to be shot-proof and its roof covering bomb-proof. For permanent works, it is a securely located, commodious chamber ample for the full service of the guns during a protracted siege.

Powell, BADEN, F.R.S., 1796–1860. Prof. of Geometry at Oxford from 1827; writer on calculus and optics; contributor to *Essays and Reviews*, 1860. *Plurality of Worlds*, 1856; *Order of Nature*, 1859.

Powell, JOHN WESLEY, LL.D., b. 1834. Geologist who conducted 1867 an expedition to Utah, first investigated the grand cañon of the Colorado River, and was for some years chief of the Geological and Geographical Survey of the Territories; director U. S. Bureau of Ethnology 1879, director U. S. Geological Survey 1880–94.

Power. Rate of doing work. It is equal to the whole work done in a given time divided by the time. The practical unit of power is a horse-power. See WATT.

Power. Primarily, result of repeating a quantity as a factor. In a wider and more usual sense, it indicates either the power of a root or the root of a power, and is synonymous with exponent.

Power, HENRY, b. 1829. London surgeon, lecturer at St. Bartholomew's and Westminster hospitals. *Diseases of the Eye*, 1868; *Human Physiology*, 1884.

Power, TYRENE, 1797–1841. Irish actor, in the U. S. 1833–35 and 1840–41. *Impressions of America*, 1835.

Power of Attorney. Authority in writing to act for another.

Power of a Locomotive. At usual speed, measured by the load it can draw on a level track. This varies from 500 to 3,000 net tons, the former being for light passenger, the latter for heavy freight locomotives. The pull required to draw 1,000 tons on a level railroad is ab. 30 tons. See LOCOMOTIVE.

Powers. Methods resorted to, after the statute of uses was enacted, of causing a case, with its accompanying estate in land, to spring up at the will of any given person; in the U. S., generally regulated by statute.

Powers, HIRAM, 1805–1873. American sculptor, active in Florence. The *Greek Slave*, of which there are six replicas, is his best-known work.

Powers, HORATIO NELSON, D.D., 1826–1890. American poet. *Ten Years of Song*, 1887.

Power Transmission. For short distances power is usually transmitted by wire cables or by compressed air. The transmission of power by electricity through wires has been accomplished for 150 m. In 1897 cars were run by electricity

transmitted by a third rail, 93 lbs. to the yard, 13 m. on the New York, New Haven & Hartford R. R., in 18 minutes.

Powhatan, ab.1550–1618. Indian chief in s.e. Va., who gave the settlers of Jamestown much trouble; father of Pocahontas.

Powis Castle. See WELSHPOOL.

Pownall, THOMAS, LL.D., 1722–1805. Gov. of Mass. 1756–60; M.P. 1761–81, with some intervals; friend of liberty, and writer on America.

Poynter, EDWARD JOHN, R.A., b. 1836. English painter of historic and classic subjects; Slade Prof. of Fine Arts at University Coll., London, 1870–75; director of art schools at South Kensington 1875; pres. Royal Academy 1896; knighted 1896.

Pozzi, SAMUEL JEAN, b. 1846. Parisian specialist in the diseases of women.

Pozzo di Borgo, CARLO ANDREA, COUNT, 1764–1842. Corsican enemy of Napoleon, long in the Russian service; ennobled 1825; envoy to England 1834.

Pozzuoli. Town 7 m. w. of Naples, anciently Puteoli; notable for its remains of antiquity. Pop. ab. 12,000.

Pradier, JEAN JACQUES, 1792–1852. Swiss sculptor, active in Paris; influenced by Canova. He has important works in the Louvre.

Pradier-Fodéré, PAUL LOUIS ERNEST, b 1827. French writer on international, military, and commercial law.

Prado, MARIANO IGNACIO, b. 1826. Pres. of Peru 1867 and 1876–79.

Pradon, NICOLAS, 1632–1698. French playwright, rival of Racine.

Præabdomen. See ABDOMEN.

Præcoces. Young of birds like the common fowl, which, when hatched, can seek their own food at once.

Praed, WINTHROP MACKWORTH, 1802–1839. English poet, unequaled in *vers de société;* M.P. 1830. His writings were first collected in America 1844.

Præfectus. In Rome, under the kings, officer appointed to command the city in the king's absence. Under the republic, prefects were sent to some of the allied towns to administer justice in place of the prætor. The emperors established a prefect of the city, who was a species of mayor. The prætorian guards were under one or more prefects, who exerted great influence, especially in deciding the succession to the throne.

Præfloration. See ÆSTIVATION.

Præfoliation. See VERNATION.

Præmaxillæ (INTERMAXILLÆ). Bones in front of the maxillary bones of the upper jaw of Vertebrates; not distinct in adult man.

Præoperculum. Most anterior of the four bones which constitute the operculum or gill-covers of fishes.

Præraphaelites. See PRE-RAPHAELITES.

Præstomium. Præoral lobe of Annelids.

Prætor. In early Rome, supreme magistrates generally known as Consuls. Later on, a separate magistracy was created with this title, which stood next to the consuls and had charge of the judicial duties of the government. At first, one sufficed. Then a second was appointed to judge in cases between Romans and foreigners, one being called the Prætor Urbanus and the other the Prætor Peregrinus. When Sicily and Sardinia were annexed, each received a prætor. Then two more were added for Spain. Sulla increased this number still further. They were elected by the people at the assembly of the centuries.

Prætorian Guard. Personal guard of the Roman emperor, instituted by Augustus 13 B.C. Vitellius increased it from 10 to 16 cohorts, 1,000 men each. Later they assumed to depose and elect the emperor. They set the diadem for sale 193, and were disbanded 312.

Præzygapophysis. See ZYGAPOPHYSES.

Praga. Suburb of Warsaw; site of bloody battle between Poles and Russians Nov. 4, 1794, in which 30,000 Poles were killed by Suwarrow. Near it, Feb. 25, 1831, the Poles defeated the Russians, who lost 4,000 killed and wounded, 6,000 prisoners, and 12 cannon.

Pragmatic Sanction. Ordinance issued by the executive of a state; in especial, that of Charles VII. of France 1438, securing the liberties of the Gallican Church; and another, by Charles VI. of Germany 1724, settling his hereditary dominions on his eldest daughter, Maria Theresa. The name comes from the Eastern Empire.

Prague. Capital of Bohemia, on the Moldau; settled ab. 722 and again ab. 1100; taken 1424 by the Hussites. Here the Austrians defeated Frederich V. of Bohemia 1620. It was taken by the Swedes 1648, by the French under Saxe 1741, and by Frederick II. of Prussia 1744, who here defeated the Austrians 1757. It has some fine old buildings and extensive manufactures. Pop., 1890, 184,109, much increased by suburbs.

Karlsbrucke at Prague.

Prague, UNIVERSITY OF. Chartered by Charles IV. 1348; important and influential in the time of Huss, when it drew students from all parts of Germany, England and France; reconstituted 1881, with a Czech and a German section. It has over 300 instructors, ab. 3,600 students, and a library of ab. 200,000 vols.

Prairie. The prairies of N. America occupy a strip of country lying between the forested plains on the e. and the treeless plains on the w. It is a debatable ground, where through a deficiency of rainfall the conditions are somewhat unfavorable for tree growth, so that slight discouragements, such as forest fires, have greater effect than elsewhere. Prior to settlement, from 1 to perhaps 15 per cent of this area was covered with woods, the proportion decreasing westward.

Prairie Dog, or PRAIRIE MARMOT. Rodent of genus *Cynomys*, of the arid Rocky Mt. region. They are a foot long, have a short hairy tail and brown fur, live in colonies, and burrow, making extensive galleries, heaping up mounds at the

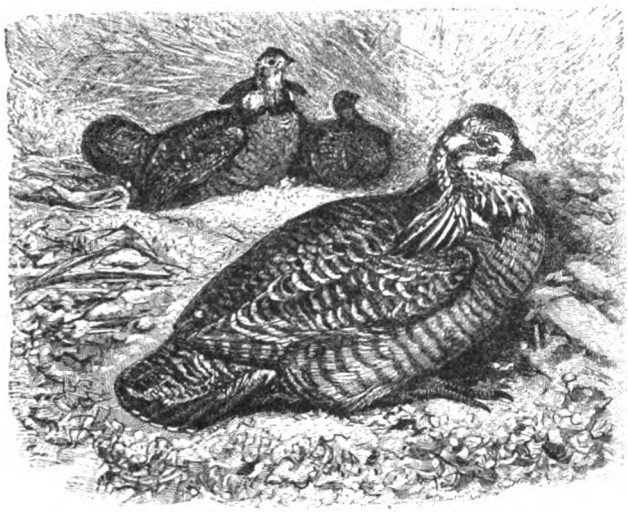
Prairie Dog (*Cynomys ludovicianus*).

entrances, on which they sit, keeping up an incessant barking. They are shy and difficult to domesticate. In their retreats live rattlesnakes and burrowing owls, mutual enemies, and both enemies of the marmots.

Prairie Grove. In Ark.; scene of a battle Dec. 7, 1862.

Prairie-Hen, or CHICKEN (TYMPANUCHOS or CUPIDONIA). Grouse of the U. S., with naked, inflatable sacs on each side of neck (beneath tufts of long feathers), by means of which a

booming sound is made in the spring. In *T. cupido* of e. U. S. the neck-tufts of the male are sharply pointed, while they are



Prairie-Hen (*Tympanuchos cupiod*).

rounded in *T. americanus* of the West. The former is nearly exterminated, the latter is rapidly decreasing in numbers.

Prakrit. Dialects of India, closely related to the Sanskrit, with inscriptions and literature as old as our era.

Pram, KRISTEN HENRIKSEN, 1756–1821. Danish critic, poet, and dramatist; ed. *Minerva*. *Works*, 6 vols., 1824–29.

Praseodymium. Pr. At. wt. 143.6. Element found in didymium; discovered by Auer von Welsbach 1885; salts of an intense leek-like green color, which give a characteristic absorption spectrum.

Praseodymium Oxides. Pr_2O_3. Greenish-white powder, soluble in acids; formed by reduction of the heptoxide. —Pr_4O_7. Heptoxide. Dark-brown powder, obtained by heating didymium nitrate or oxalate. It dissolves in acids with evolution of oxygen.

Pratinas, 5th cent. B.C. Greek dramatic and lyric poet.

Pratt, CALVIN EDWARD, 1828–1896. Justice N. Y. Supreme Court from 1869.

Pratt, ENOCH, 1808–1896. Founder of the Baltimore Free Circulating Library 1883–86.

Pratt, SILAS GAMALIEL, b. 1846. American composer of symphonies, operas, cantatas, and smaller pieces.

Pratt, PARLEY PARKER, 1807–1857. Mormon apostle and author, as was also his brother, ORSON, 1811–1881.

Pratt, THOMAS GEORGE, 1804–1869. Gov. of Md. 1844–47; U. S. Senator 1850–57.

Pratt, ZADOCK, 1790–1871. M.C. from N. Y. 1837–39 and 1843–45; founder U. S. Bureau of Statistics.

Pratt Institute. Founded by Charles Pratt of Brooklyn 1887. A faculty of 9, with 123 assistants, instruct ab. 4,000 students in high-school branches, the domestic and industrial arts, kindergarten practice, and library training. A library building, with a capacity for 200,000 vols., in 1896 contained 57,000 vols.

Pratt Truss. Bridge truss having its vertical web members in compression and its inclined web members in tension. It was invented by Caleb Pratt in 1852, and originally built mostly of timber. Numerous varieties in iron and steel are used both for highway and railroad structures.

Pratz, LEPAGE DU, ab.1690–1775. Dutch-French explorer of the Mississippi and the West 1718–34. *Hist. Louisiana*, 1758.

Praxiteles. Greek sculptor of 4th century B.C., and representing its peculiar tendencies, as contrasted with those of the 5th century and of Phidias. His was the art of grace and loveliness, as opposed to that of grandeur or sublimity. Hence his preference for subjects like Aphrodite, Eros, and Dionysos. The later type of Aphrodite or Venus is largely his creation. No original work of his was known until 1877, when his Dionysos carrying the infant Hermes on his arm was found at Olympia, where it still remains. His lizard-slaying Apollo is known by several copies; one is in the Capitol Museum at Rome.

Pray, ISAAC CLARK, 1813–1869. American playwright and journalist.

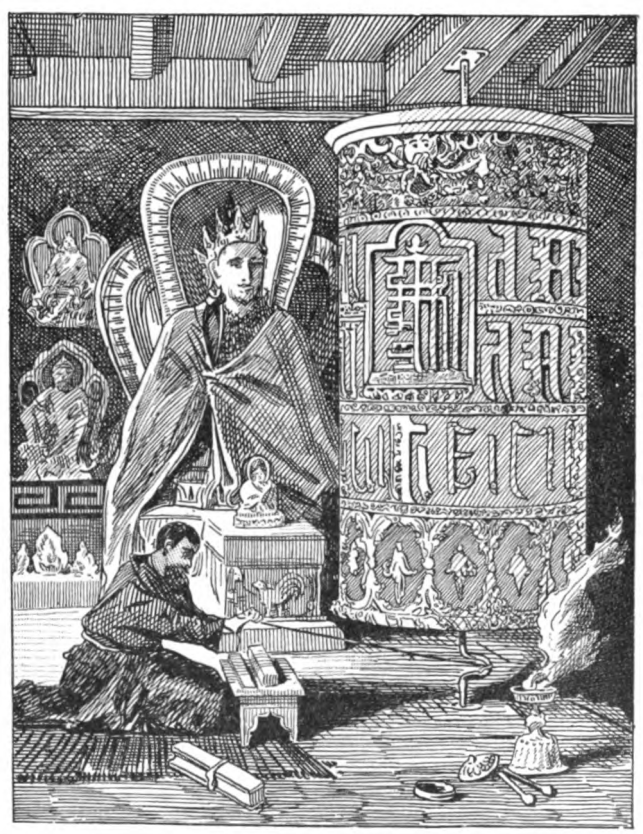
Pray, PUBLIUS RUTILIUS RUFUS, 1795–1840. Reviser of Miss. statutes 1833–36; judge 1837.

Prayer. Address to Deity, chiefly in the form of supplication; in most lands and ages the leading feature of private devotion and public worship. In the latter, precomposed forms have been generally used, except among certain Protestant bodies since the Reformation: their use is justified by the Lord's Prayer, and its introductory words, "After this manner pray ye" (Matt. vi. 9). See PRAYER BOOK.—The object of prayer has been variously conceived. In rude ages and among the unlettered it was credited with power to influence the Divine plans and change the course of nature. In a more spiritual view, it aims to elevate and purify the worshiper's mind by bringing it into harmony with and subjection to God's will. Its inward ends may be thus attained, and its external objects incidentally in a measure, in accordance with psychic laws and without imagining any violation of those of the physical world.

Prayer, BOOK OF COMMON. Drawn up under Edward VI., modified under Elizabeth, and afterward, with local variations, the universal directory of Anglican worship.

Prayers for the Dead. Offered to some extent by later Jews and early Christians; approved in R. C. and Eastern Churches, but not by Protestants.

Prayer Wheel. Mechanical contrivance used in worship in Buddhist countries to multiply the reiteration of certain formulas of invocation, or recitation of sacred writings; believed to have been in use among the Buddhists for 14 centuries; based on the idea of its being a merit to be continually



Large Praying Wheel at Soonum, Thibet.

reciting portions of the writings of Buddha. They vary greatly in size, large wheels in Thibet being turned by water power. Some of the Japanese wheels contain large collections of the sacred books. The well-known hand wheel of Thibet is frequently embossed with sacred words, and contains strips of paper or cloth inscribed with charms or prayers.

Preaching. Prominent part of the office of ministers of any religion, in proportion as it claims intellectual, moral, and spiritual character; absent in such as are fetichistic or merely formal; chiefly marked in Christianity. It consists in various degrees of instruction and exhortation, and has its place in most leading occasions of public worship. It was the main and primary portion of the work of apostles and evangelists,

and in former ages, as especially with the Puritans, was more frequent and extended than is customary now. Its influence has often been very great, as with Peter the Hermit in urging the first crusade, and Whitefield and the Wesleys in the 18th century. See HOMILETICS and SERMON.

Pre-Adamites. Men living before the time of Adam; now seldom used, the phrase Prehistoric Men being more accurate. See CAVE DWELLERS and KENT'S CAVERN.

Preble, JEDEDIAH, 1707–1784. Brig.-gen. Mass. troops 1759 and 1774.—His son, EDWARD, 1761–1807, conducted the attack on Tripoli 1803–4, which led to the abolition of the European tribute long paid to the Barbary pirates, and the peace of 1805. —His nephew, GEORGE HENRY, U.S.N., 1816–1885, served in the Mexican and Civil wars, and became Rear-Admiral 1876.

Preble, WILLIAM PITT, LL.D., 1783–1857. Judge Me. Supreme Court 1820; U. S. Minister to the Netherlands 1829.

Precedence. Order in which persons are entitled to follow one another on public occasions. In England it is dependent upon statutes of Henry VIII. and subsequently, on royal letters patent and ancient custom; disputes are decided by officers of the crown; in Scotland, the Lyon Court has jurisdiction. The peerage and baronets rank as follows: England, Scotland, Great Britain, Ireland, United Kingdom, Ireland after the Irish Union. The order of rank is as follows, after the royal family; duke, marquise, earl, viscount, baron, banneret, baronet, knight, esquire. Persons of the same rank follow the order of the creation of that rank. Married women and widows have the rank of their husbands and unmarried women the rank of their oldest brother. Marriage does not take away from a woman the precedence by birth or creation.

Precedents. Legal forms approved by usage or judicial authority, or judicial decisions which declare a legal principle.

Precepts of Noah. Supposed by the Rabbis to have been received by Noah from Adam; one who accepted them, though not circumcised, had a hope of salvation. They were seven, mainly against idolatry, blasphemy, bloodshed, uncleanness, and theft, and were observed by proselytes of the gate.

Precession of the Equinoxes. Slow motion of the equinoctial points along the ecliptic. The mean value is 50.2″ per annum, requiring 25,800 years to complete a revolution. It was discovered by Hipparchus ab.100 B.C.

Precieuses. Feminine habitués of the Hôtel de Rambouillet, Paris, 17th century, who affected superfine graces of expression like those of the English euphuists; satirized by Molière.

Precious Metals. Gold, silver, and platinum, so called from their high price compared with that of other metals employed in the arts, and from the special uses for which they are peculiarly adapted.

Precious Stones. A large number of minerals, hard, transparent, beautifully colored, and brilliant in luster, have been regarded, at one time or another, as belonging in the category of precious stones, but the diamond and the varieties of corundum known as sapphire and ruby are almost the only ones that have received a general recognition as belonging here. Originally precious stones were prized and worn principally for their talismanic virtues. Engraved emeralds have been found in Theban tombs. The Tyrians prized most highly the sardius, topaz, diamond, beryl, onyx, jasper, sapphire, emerald, and carbuncle. On the Jewish High Priest's breastplate were the sardius, topaz, emerald, carbuncle, sapphire, jasper, ligure, agate, amethyst, chrysolite, beryl, and onyx. The most precious Assyrian cylinder seals are cut out of sard, emerald, lapis lazuli, agate, onyx, jasper, and rock crystal. In Rome, after the Eastern conquests, pearls and emeralds were most eagerly sought after. Julius Cæsar paid $240,000 for one pearl to give to Servilia. Cleopatra dissolved and drank another valued at $25,000. A pearl and emerald set worn by Caligula's wife Lollia Paulina cost $1,600,000. The Romans used pearls and gems in adorning walls and ceilings. Nero's palace walls were covered with them. They were also used to embroider shoes and garments. The rich used large emeralds as a kind of lorgnette. It was fashionable to set the best gems in drinking cups, and rings, often cut out of solid stones, were largely used. The Carthaginians gathered three bushels after the battle of Cannæ. The ruby, a supposed antidote to poison, always stood first in value. Diamonds were little prized, though one is mentioned belonging to Herod the Great's sister Berenice. The diamond only ranked fifth in the 13th century, below the pearl, ruby, emerald and chrysolite. Benvenuto Cellini, 1540, classed it below the ruby and emerald, and valued it at one-eighth of the ruby. Diamond-cutting, though practiced in India and China in remote ages, was not discovered in Europe till the 15th century, after which this gem appreciated in value and favor. See JEWELRY, DIAMOND, RUBY, etc.

Precipitate Ointments. Red ointment contains red oxide of mercury and white ammoniated mercury. They are used in cutaneous eruptions.

Precipitation. In Chemistry, the deposition, by means of air, gas, or chemical reagent, of a solid previously held in solution or produced by chemical action.

Precocity. Premature development of the body or the mind. In the former the body grows rapidly with the physical signs of maturity, frequently followed by early decay. In the latter it is often a symptom of PARANOIA (q.v.). Children with precocious intellects ought to receive special care, in order to maintain a sturdy body and to train the will to control the nervous system.

Precoracoid. Anterior of the two ventral elements of the shoulder-girdle, best developed in Reptiles.

Predatory War. The wanton destruction of the person and property of non-combatants, or engaging in pillaging, plunder, and rapine are acts of predatory warfare, which, not having the sanction of absolute military necessity, are not now practiced in civilized warfare.

Predestination. Doctrine that all things, including the salvation or perdition of every man, rest upon an eternal purpose of God. See ELECTION.

Predicate. In Logic, what is affirmed or denied of the subject; in Grammar, verb, with words depending on it.

Preece, WILLIAM HENRY, F.R.S., b. 1834. English writer on electricity and telegraphy.

Pre-emption. Privilege accorded an actual settler upon a limited portion of the public lands to purchase that portion in preference to all other applicants; a forced purchase instead of confiscation.

Pre-existence. Opinion held by Plato and other Greeks, and by many in later ages, that human souls existed prior to their entrance into the bodies with which they are identified in their present state.

Prefect. Title of many officers and magistrates of ancient Rome. In modern France the chief of police of each department. See PRÆFECTUS.

Pregnancy. Condition of the females of mammals during the period of gestation, coterminous with the period of embryonic life of the offspring, which varies in different species. It begins with the fecundation of the ovum and ends with the birth of the young. In reference to woman, the medical canon differs from the legal view in that during this entire period life is considered to be present, and it is as virtually murder to destroy an embryo before quickening, which occurs in the fourth month, as after that period. The duration of pregnancy with woman is about 280 days, varying up to 10 days either way.

Prejevalski, NICOLAI, 1839–1888. Russian traveler in Asia.

Prelate. Ecclesiastical dignitary, usually a bishop or abbot, exercising inherent, not merely delegated jurisdiction.

Prelude. In Music, a preliminary movement, ostensibly an introduction to the main body of a work and frequently of intrinsic value. See OVERTURE.

Premature Delivery. Induction of the birth of a child before the expiration of the period of gestation and after the period when it is possible for the child to live. As children so born are not fully developed, especial care is necessary to preserve life.

Premillenarians. See MILLENARIANISM.

Premonstrants, PREMONSTRATENSIANS, or NORBERTINES. Order of canons founded in France 1120 by St. Norbert; confirmed by Honorius II. 1126; once numerous and powerful throughout Europe, now much decayed.

Prence, or **Prince,** THOMAS, 1601–1673. Gov. of Plymouth, Mass., 1634, 1638, and from 1657.

Prentice, GEORGE DENISON, 1802–1870. Ed. Louisville, Ky., *Journal* from 1831. *Life of Clay*, 1831; *Prenticeana*, 1859; *Poems*, 1875.

Prentiss, SERGEANT SMITH, 1808–1850. M.C. from Miss. 1837–39; eminent as an orator.—His brother, GEORGE LEWIS, D.D., became prof. in Union Theol. Sem., N.Y., 1873.—His wife, ELIZABETH (PAYSON), 1818–1878, m. 1845, pub. many juvenile books and devout poems. Her *Stepping Heavenward*, 1869, was very popular.

Preparing Salt. See SODIUM STANNATE.

Preposition. Particle, or word other than verb, governing a noun or pronoun.

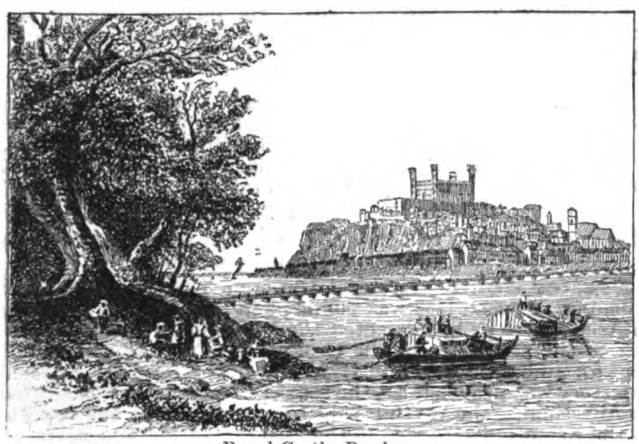
Prepotency. Power of one parent to transmit its own characteristics to its offspring, no matter what the qualities of the other parent may be. This power is usually obtained through descent from a long line of ancestors all of whom have possessed in marked degree the same characteristics, but it may be present as an individual characteristic.

Prepotency. Superior attraction certain sexual cells (or nuclei) have for each other, as shown by placing pollen

upon a stigma, from flowers removed by various degrees of relationship from the female flower experimented upon. It will be found that a certain degree of removal is most favorable, as when the pollen from a flower of a different plant grows faster toward the ovule than that from a flower from the same plant, and also faster than pollen from adifferent variety or species. Same principle applies in the animal kingdom. See STERILITY.

Pre-Raphaelites. Originally, a school of German painters at Rome, headed by Cornelius and Overbeck, ab. 1820. Their tendencies were religious and transcendental, and inclined to Catholicism, which several of them adopted. The impulse to this movement came from the study of the earlier Italian painters, like Giotto and Fra Angelico; hence the name, meaning that they favored, above all, the age of primitive belief and the style of its art as contrasted with a more technically developed but less deeply religious style. The name was transplanted to a school of English painters whose aims were vaguer, though their sympathies were somewhat akin to those of the Germans. These, like W. Holman Hunt, represented a sincere and earnest spirit in art, but they committed the great mistake of attempting to revive an archaic technique in oil-painting. Hence their movement was a failure.

Presburg, or PRESSBURG. Anciently Posonium. Old town of Hungary, on the Danube, 35 m. e. of Vienna; capital 1541–1784; taken by Austrians 1621. The royal castle, on the



Royal Castle, Presburg.

Schlossberg, is a prominent feature, on a plateau 273 ft. high, overlooking the Danube. It was destroyed by fire 1811. Presburg has an important trade in grain, linen and Hungarian wines. Pop. 1890, 52,411.

Presburg, PEACE OF. Dec. 26, 1805, between Austria and France, by which Bavaria was created into a kingdom with accessions from Austria and Prussia; Würtemberg also, with Austrian lordships in Swabia was added; Venice was included in kingdom of Italy; Austria obtained only Salzburg; the German empire was dissolved, and the Confederation of the Rnine inaugurated.

Presbyopia, or LONG-SIGHT. Natural accommodation of the eye for distances longer than that of ordinary vision, so that near objects are not focused on the retina, and thus appear indistinct. The usual cause is the fact that the antero-posterior diameter of the eye is too short, the focus being behind the retina. It is corrected by using converging glasses. Condition comes on, in normal eyes, when the person is about 45 years of age. See ACCOMMODATION OF THE EYE.

Presbyter. Elder; member of the college of pastors appointed by St. Paul and other apostles in each city; in N. T. called also Bishop; soon distinguished from the latter as another clerical order.

Presbyterianism. Church polity intermediate between Episcopacy and Congregationalism. It holds the parity of all presbyters, submits each congregation to a college of elders, and the various congregations to a series of church courts. See SESSION, PRESBYTERY, SYNOD, and GENERAL ASSEMBLY.

Presbyterians. In Scotland, the Established Ch. has ab. 1,500 ministers and 600,000 communicants; the Free Ch., 1,150 and 340,000; the United Pres. Ch., 610 and 190,000; other bodies, ab. 35 and 5,000. In England, ab. 325 and 70,000. In Ireland, ab. 680 and 110,000. In Wales (chiefly Calvinistic Methodists), ab. 675 and 140,000. In Canada, ab. 1,100 and 185,000. In the U. S. the Presbyterian Ch. has ab. 7,970 and 1,100,000; Cumberland P., 1,910 and 200,000; United P., 835 and 116,000; Reformed P., Associate P., etc., 390 and 410,000. Including affiliated communions and missions, the Alliance formed 1875 and meeting since 1877 in Pan-Presbyterian Council represents more than 24,000 ministers and 4,000,000 communicants throughout the world.

Presbytery. Body of elders; among Presbyterians, delegated assembly of several churches, the first court of appeal above the session.

Prescott, ALBERT BENJAMIN, b. 1832. Prof. of Chemistry in Univ. Mich. since 1870; author of several text-books.

Prescott, GEORGE BARTLETT, b. 1830. American electrician, inventor, and writer on telegraphy.

Prescott, WILLIAM HICKLING, 1796–1859. American historian of high rank, eminent for careful research and attractive style rather than for profundity or breadth of view. *Ferdinand and Isabella*, 1837; *Conquest of Mexico*, 1843; *Miscellanies*, 1845–51; *Conquest of Peru*, 1847; *Philip II.* (incomplete), 3 vols., 1855.—His grandfather, WILLIAM, 1726–1795, served in the French war and in the Revolution till 1777; he commanded at Bunker Hill.

William Hickling Prescott.

Prescription. Rule of Roman and International law, by which the uninterrupted use of specific property for a certain time gives to the possessor legal title thereto. In English law it is confined to incorporeal hereditaments, such as rights of way and of common.

Prescription. The recipe given by the physician to the pharmacist for the preparation of a medicine. The character ℞ usually prefaces a prescription, and is the initial letter of the Latin *recipe* = take, and a portion of the symbol of Jupiter ♃, used of old as a pious invocation propitiating the gods when ordering a remedy.

Presentment. In Criminal Law, used of the official act of a grand jury in making known certain offenses, of their own motion and without a complaint from an injured party.

Preservation of Food. Meats are preserved by packing them in salt, sometimes with addition of saltpeter, or by drying and submitting them to the smoke of hard wood, the creosote of which prevents decomposition. Pemmican is lean deer flesh, dried in the sun or air. Fishes of various kinds are salted and air-dried. Dessication by hot air or vacuum was first effected by Chollet of Paris 1854, with fruit and vegetables, which were afterward compressed. Canning of cooked meats, vegetables, or fruits was first accomplished by Werthenner 1839–41, the cans being filled with the cooked food, water, gravy, or sugar and water are added to fill spaces, the cover, with small opening, soldered on, then brought to boiling in a water bath, and finally closed. Green vegetables are preserved in salt water or vinegar. Sardines are preserved in olive or cotton-seed oil. Potted meats are covered with melted lard. Sawdust protects fruit, and charcoal preserves meat from decomposition. Preserved fruit is prepared by cooking it in syrup with equal weight of sugar. Alcoholic liquors are sometimes added. Eggs may be kept in salt or lime-water. Cold storage and refrigerators are now used for preserving all kinds of food from decomposition.

Preservation of Timber. Timber in structures is exposed to dry-rot and to the attacks of boring insects. Preservatives are introduced to arrest or prevent attacks from these directions. To prevent dry-rot, the object is to displace or coagulate the albuminous matter in the sap-ducts, and if this can be effected by a material deterrent to boring insects, the object is secured. Timber continually immersed in water or imbedded completely in cement deteriorates very slowly. The best known preservative processes are the creosote, known as Bethell's, the sulphate of copper, known as Margary's or Boucherie's, the perchloride of mercury, known as Kyan's, and the chloride of zinc, known as Burnett's, processes. The creo-

sote process is applied either hot in open tanks, or at high pressure in closed tanks, and is the most used. The wood is more inflammable, but will not be attacked by boring insects. See CREOSOTING, KYANIZING, and BURNETTIZING.

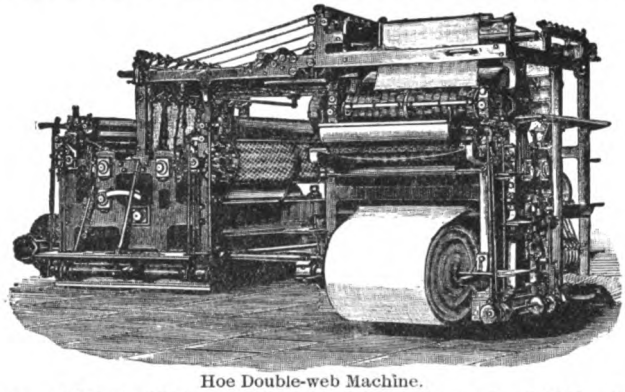
President. Chief executive officer of U. S. since 1789; elected quadrennially; succeeded by vice-pres. in case of death or disability during his term; eligible for re-election. The other republics use the same title.

Presidential Electoral Commission. See ELECTORAL COMMISSION, PRESIDENTIAL.

Presl, KARL BORIWOG, 1794–1852. Prof. of Natural History and Technology at Prague. *Flora sicula*, 1826; *Reliquiæ Hænkeanæ*, 1830–36; *Symbolæ botanicæ*, 1832–33; *Tentamen pteridographiæ*, 1845.

Press, HYDRAULIC. See HYDRAULIC PRESS.

Press, PRINTING. Machine by which the paper of books and journals is pressed upon the inked type to produce printed pages. The earliest presses were worked by hand, were of wooden frames, and could print but a small area at one pressure of the platen. The power was obtained by turning a screw. The Stanhope press of 1798 was an iron frame press, with levers to act upon the pressure screw in an easier way. The Columbian press of G. Clymer of Phila., 1817, counterweighted the platen, and replaced the screw by levers: the Washington press of S. Rust 1829 used the elbow-joint to produce the pressure in combination with levers, thus improving on O. Tuft's elbow-joint press of 1813. The power presses either use a flat bed of type, or put the type upon the surface of a revolving cylinder. The Adams press, Boston, 1830–36, pressed the flat form of type upward against a flat platen above it, the upward pressure being produced by an elbow-joint driven by a link from a crank, the same crank-shaft causing inking rollers to traverse the type at each stroke, with intervals of rest when the impression is made. These are caused by the shape of slots in the links which drive the rollers. The Adams press is used for fine work and will supply 800 impressions per hour. To replace the flat impression plate or platen by a cylinder was the fundamental idea of the earlier inventors of power presses, as in the first



Hoe Double-web Machine.

press of König 1811, and Applegath and Cowper's of 1827. In the stop-cylinder press, the form of type slides on ways under inking rollers, and the impression cylinder above it has either a flat side or a part of less radius by which contact is avoided during the return of the type. Such presses will make 1,000 impressions per hour. To put the type on the revolving cylinder required the perfection of the stereotyping processes. Previous to the patents of Col. R. M. Hoe 1842, Nicholson had used wedge-shaped type to avoid the difficulties of the curvature of the cylinder, and Napier 1841 used tapering rules between the lines of straight type. When the curved stereotype had become commercially practicable, the Hoe rotary press was evolved, where the form was borne on a large drum, the drum of such size that one-quarter of the circumference only bore the type, and the rest was inking surface. Two, four, six, or eight impression cylinders were grouped about this drum, fed each by an attendant. The largest size of these lightning presses, with five feeders on each side, could print 20,000 impressions per hour. The last improvement has been to use a continuous web of paper. The "web perfecting" presses can print from 12,000 to 72,000 newspapers per hour, according to number of pages, cut, pasted, folded, and counted in lots.

Pressburg. See PRESBURG.

Pressed Brick. Brick subjected to pressure before being burned, so as to render them harder and smoother than common BRICK (q.v.).

Pressensé, EDMOND DE, D.D., 1824–1891. Protestant pastor in Paris 1847–70; deputy 1871–76; life senator 1873. *Christianity and Social Questions*, 1849; *The Redeemer*, 1854, tr. 1864; *Three First Centuries*, 1859–77, tr. 1869–78; *Ch. and French Revolution*, 1864, tr. 1869; *Jesus Christ*, tr. 1866; *Contemporary Portraits*, tr. 1880; *Study of Origins*, tr. 1883.

Pressgang. Means of securing forced recruits for the English navy from early days till ab. 1830; an atrocious system, which scorned personal liberty and wrought untold misery.

Pressing to Death. See PEINE FORTE ET DURE.

Pressirostres. See PALUDICOLÆ.

Pressure. See FORCE and TOUCH.

Pressure Gauge. Device for estimating the pressure upon the base of the chamber of a gun caused by the explosion of the charge. Rodman's gauge consists of a housing screwed into the bore, containing a soft copper disk, upon which a steel cutter, terminating in a piston, rests. Upon firing the charge the cutter is driven into the disk, making a cut. A similar cut by the same cutter is obtained by static pressure in a similar disk, and this pressure per square inch is taken to be that of the interior of the chamber. In the crusher gauge, the shortening of a soft copper cylinder is employed instead of the cutter. See GAUGE, STEAM, and PIEZOMETER.

Pressure Head. Height of a column of water which will balance the pressure of the water at a point in a pipe or closed vessel is the pressure head at that point. If the water in the pipe is in motion the pressure head is less than the static head. See HEAD.

Pressure of Population. Its increase beyond the amount of subsistence which in the existing condition of knowledge and of the natural agents of production the country is able to provide.

Pressure of the Wind AGAINST A FIXED OBSTACLE. This depends approximately on the velocity of the wind and the size of the body; its shape, which is frequently neglected, is equally important. The pressure may be stated in pounds per sq. foot, and is usually computed by the formula,

$$p. = 0.5\ v^2.$$

This relates strictly to a thin plate one foot square, and has no simple relation to bodies of other shapes and sizes.

Prester John. Mythical Christian emperor, Presbyter Johannes, who ab. 1150 was rumored in Europe to be reigning in Asia, where he had defeated the Mussulmans and was coming to the assistance of the Crusaders. Pope Alexander III. sent an ambassador to him 1177, who never returned. When the story was proven false, the seat of Prester John was shifted to Abyssinia. The myth is said to have arisen in the reports of the Nestorian successes in the East.

Preston. Old town of Lancashire, on the Ribble, 31 m. n.w. of Manchester; important for its cotton and other manufactures. Near it Cromwell signally defeated a royalist army Aug. 17, 1648. Pop., 1893, 110,225.

Preston, HARRIET WATERS, b. ab. 1843. American author and translator, chiefly from the French. *Aspendale*, 1872; tr. Mistral's *Mireio*, 1873; tr. Virgil's *Georgics*, 1881. Her studies of Cicero and other ancient and mediæval authors are valuable.

Preston, MRS. MARGARET (JUNKIN), 1820–1897, m. 1857. American poet. *Beechenbrook*, 1866; *Colonial Ballads*, 1887.

Preston, THOMAS SCOTT, 1824–1891. Vicar-gen. of N. Y. 1873; devotional writer.

Preston, WILLIAM CAMPBELL, LL.D., 1794–1860. U. S. Senator 1837–43; pres. Coll. of S. C. 1845–51; nephew of Patrick Henry; considered the most finished of Southern orators.—Of his cousins, WILLIAM, 1806–1887, was M.C. from Ky. 1852–55, and U. S. Minister to Spain 1857–61; WILLIAM BALLARD, 1805–1862, was M.C. from Va. 1847, and U. S. Sec. of War 1847–48. Others of this family attained distinction.

Preston Pans. Village 8 m. e. of Edinburgh, where the young Pretender, at the head of his Scotch adherents, defeated 2,000 English under Sir John Cope, Sept. 21, 1745. The royal force was cut in pieces by a single charge of the Highlanders. Pop. ab. 2,650.

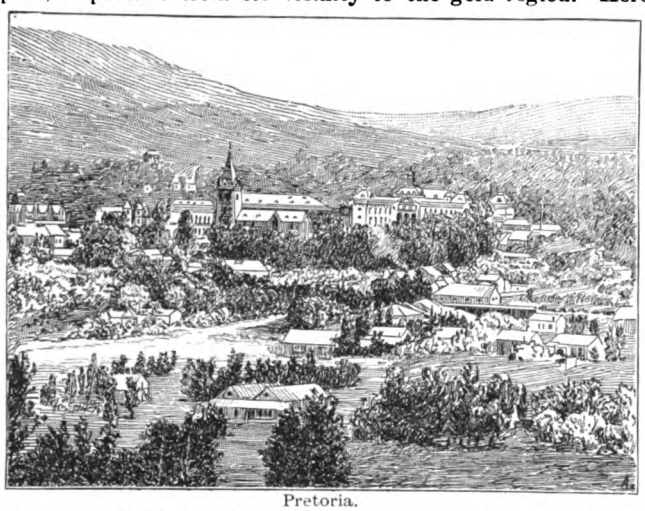
Prestwich, SIR JOSEPH, 1812–1896. Prof. of Geology at Oxford 1874–88; author of papers on Tertiary Geology, followed by two on the Quaternary beds of the valley of the Somme, in which he was the first to show on sufficient evidence that man was contemporaneous with the extinct Mammalia; author also of memoirs on submarine and underground temperatures. *Geology*, 1886–88.

Presumptions. Inferences of the existence or non-existence of a material fact, which a judge or jury is legally warranted in drawing from the evidence in the case.

Pretenders. Son and grandson of James II. of England, James Francis Edward Stuart and Charles Edward, who strove to recover the throne by Jacobite risings in Scotland 1715 and 1745.

Pretoria. Capital of S. African Republic; 1,040 m. n.e. of

Capetown, and 285 m. w. of Lorenzo Marques, its nearest port; important from its vicinity to the gold region. Here



Pretoria.

Jameson and his companions were confined 1896 after their raid. Pop. ab. 7,000.

Prévalaye, PIERRE DIMAS, MARQUIS DE, 1745–1816. French naval officer, in America 1778–81; Commander 1783, Admiral 1815; author of several memoirs.

Preventive Checks to Population. Influences which tend to prevent the procreation of children, as the desire to keep up a high standard of living in food, dress, the decencies or luxuries of life.

Previous Question, or CLOSURE. In England and U.S., parliamentary means of closing debate.

Previtale, ANDREA, d. 1528. Italian painter.

Prévost, LOUIS CONSTANT, 1787–1856. French geologist. His researches in volcanic phenomena led to his opposing the theories of Von Buch and Elie de Beaumont on the elevation of mountain chains, ascribing such apparent elevation to gradual contraction of the nucleus.

Prévost d'Exiles, ANTOINE FRANÇOIS, 1697–1763. French novelist, originally a monk; author of near 200 vols. *Marion Lescant*, 1733.

Prévost-Paradol, LUCIEN ANATOLE, 1829–1870. Parisian essayist; Minister to the U. S. 1870. *Contemporary History*, 1862–66; *French Moralists*, 1864.

Prévost's Theory. See THEORY OF EXCHANGES.

Preyer, THIERRY, b. 1841. Prof. Jena 1869; writer on physiology.

Priam. Last king of Troy; too old to be active in the war; father of 50 sons.

Priapulidæ. See ACHÆTA.

Priapus. Greek and Roman god of fruitfulness, protector of flocks, vineyards and gardens; son of Bacchus and Venus.

Pribylof Islands. In Bering Sea; important as a resort of seals.

Price. Purchasing power of an article expressed in terms of money, or more exactly, of any one commodity other than itself.

Price, BARTHOLEMEW, b. 1818. English mathematician, Prof. of Natural Philosophy at Oxford 1853. *Infinitesimal Calculus*, 4 vols., 1848–69.

Price, BONAMY, 1807–1888. Prof. of Political Economy at Oxford from 1868. *Currency*, 1869; *Banking*, 1876; *Political Economy*, 1878.

Price, RICHARD, D.D., LL.D., F.R.S., 1723–1791. English philosopher and moralist, of the intellectualist school as opposed to Hedonism and the absolutism of Hobbes, and also to the moral sense doctrine of the æsthetic school. Chief work, *Questions in Morals*, 1758; *Reversionary Payments*, 1768; *National Debt*, 1771; *Civil Liberty*, 1776. He warmly defended American rights.

Price, RODMAN MCCAMLEY, 1816–1894. M.C. 1851–53; Gov. of N. J. 1854–56; active in founding public and normal schools.

Price, STERLING, 1809–1867. M.C. 1845–46; Brig.-gen. 1847, in the Mexican war; Gov. of Mo. 1853–57; Major-gen. of Mo. troops 1861, and active against the Union; Major-gen. C.S.A. 1862, operating in the West.

Price Current. Table of prices of any special set of commodities at a given time in a certain market.

Prichard, JAMES COWLES, 1786–1848. English ethnologist. *Physical History of Mankind*, 1813; *Egyptian Mythology*, 1819; *Eastern Origin of Celtic Nations*, 1831; *Natural History of Man*, 1843.

Prickle. In Botany, any sharp-pointed stiff epidermal appendage.

Prickly Ash. See ASH, PRICKLY.

Prickly Heat. Disease of the skin characterized by suddenly appearing eruptions covering large areas, accompanied by an intolerable prickling or burning and excessive sweating. It is a disease of hot weather. Washing the inflamed parts with a cooling lotion as with vinegar and water, or dusting with a powder containing equal parts of starch and zinc oxide, to which may be added ten per cent of powdered camphor; keeping the patient quiet and cool and the digestive apparatus in a normal condition is all that is needed for treatment in temperate climes.

Pride. Satisfaction in or admiration of one's self, without requiring the sympathy or help of others.

Pride, THOMAS, d. 1658. Officer under Cromwell; instrument of the "purge" which excluded above 100 from the Commons Dec. 1648: regicide.

Prideaux, HUMPHREY, D.D., 1648–1724. Dean of Norwich 1702. *Life of Mahomet*, 1697. His *Old and New Testament Connected*, 1715–17, has been widely used.

Pride of India. *Melia azedarach.* Showy-flowered tree of the natural family *Meliaceæ*, native of India, widely planted for ornament in warm countries; known as Bead-tree, the seeds being made into necklaces by savage tribes.

Prie-Dieu. Chair used for kneeling in prayer.

Priessnitz, VINCENT, 1799–1851. Founder of hydropathy and of the first water-cure, at Gräfenberg, Austria.

Priest. Minister of religion, duly appointed, especially under Judaism and Christianity. In the R. C., Eastern and Anglican Churches he is ordained by a bishop, and is alone authorized to consecrate the eucharistic elements. The episcopal order or character includes all the powers of the priesthood, with others peculiar to itself.

Priestley, JOSEPH, LL.D., F.R.S., 1733–1804. English philosopher and divine, discoverer of oxygen 1774, and later of nitrous, carbonic, and sulphurous oxides and other gases; famous for the union of scientific and religious sympathies; Unitarian minister at Birmingham 1780–91; radical in politics; in

Joseph Priestley.

Pa. from 1794, chiefly at Northumberland. *Electricity*, 1767; *Disquisitions relating to Matter and Spirit*, 1777; *Institutes of Natural and Revealed Religion*, 1772; *Corruptions of Christianity*, 1782. *Works*, 26 vols., 1817–32.—His great-nephew, SIR WILLIAM OVEREND, M.D., LL.D., b. 1829, knighted 1893, is prominent as a London practitioner and writer on obstetrics.

Prieto, JOAQUIN, 1786–1854. Pres. of Chili 1831–41.

Prim. See PRIVET.

Prim, JUAN, 1814–1870. Spanish soldier and politician, Marquis 1860; banished 1864; all-powerful in his last years. He

procured the expulsion of Isabella 1868, the election of Amadeus 1870, gave the nominal occasion for the Franco-Prussian war, and was murdered.

Prima Donna. Leading female singer in an opera.

Primaries (PRIMARY REMIGES). Quill feathers of a bird's wing that grow on the pinion or outer (hand) portion of the wing. They number nine or ten.

Primaries. In the U. S., meetings of voters to nominate candidates for office.

Primary Alcohols. Alcohols which upon oxidation yield an aldehyde and then an acid. They are regarded as derived from methyl alcohol by replacing one hydrogen atom with a hydrocarbon radical. Methyl alcohol, $H.CH_2.OH$; ethyl alcohol, $CH_3.CH_2.OH$. See SECONDARY and TERTIARY ALCOHOLS.

Primary Coil. See INDUCTORIUM.

Primary Compounds. Compounds conceived to be formed by substitution in a CH_3 or methyl group. Thus $CH_3.CH_2.CH_2.CH_2OH$ is a primary butyl alcohol.

Primary Root. That resulting from the first growth of the vegetable embryo; also the tap-root.

Primary Schools. In U. S., schools for children, from 6 to 14 years of age, including primary, intermediate, and grammar schools, and provided usually by the State or towns. See SCHOOLS, COMMON SCHOOLS, and COMPULSORY EDUCATION.

Primary Triangulation. Largest and most accurate triangulation upon which the location of all other stations is based. Some primary triangles have lines over 100 m. in length. The angles are usually determined with an uncertainty less than half a second.

Primate. Archbishop of the first rank, as of Canterbury and York in England, Dublin and Armagh in Ireland; a shadowy title, and, except in Hungary, a vanishing jurisdiction.

Primates. Highest order of Mammals, characterized by having perfect clavicles that articulate with the top of the sternum. The radius, ulna, tibia, and fibula are complete and distinct, and the limbs admit of pronation and supination. The digits are armed with nails, and the thumb is opposable, forming a true hand. The teeth number 32 or 36, and the molars have broad tuberculate crowns. The mammæ are two and thoracic in position. The placenta is discoidal. Some authors include Lemurs in this order, but the old orders, *Quadrumana* (Apes and Monkeys) and *Bimana* (Man), are here alone included as the sub-orders *Simiadæ* and *Anthropidæ*.

Primaticcio, FRANCESCO, 1490–1570. Italian painter, in later life active in France and in decorating the Château of Fontainebleau with stucco work and frescoes, the latter now

Mystic Marriage of St. Catherine, by F. Primaticcio.

mainly destroyed. His style is allied to that of Giulio Romano, whom he had assisted at Mantua, and represents a falling off in quality as compared with the generation immediately preceding, but is still vigorous and decorative.

Prime, FREDERICK, b. 1846. Prof. Lafayette 1870–79; assistant in Ohio Geological Survey 1869, and on 2d Pa. Survey 1874; Prof. Girard Coll. 1894.

Prime, SAMUEL IRENÆUS, D.D., 1812–1885. Ed. *N.Y. Observer* from 1840. His *Power of Prayer*, 1858, was widely circulated. *Letters*, 1880–86.—His brother, WILLIAM COWPER, LL.D., b. 1825, is an author and journalist. *Boat Life in Egypt*, 1854; *I go a-fishing*, 1878; *Pottery and Porcelain*, 1878.

Prime Cost. Expenses which a producer incurs directly and specially, in the production of a given article, apart from the general expenses of his business.

Prime Mover. See MOTOR.

Prime Number. One exactly divisible by no number save itself and unity; opposed to composite.

Primer. Two copper tubes at right angles to each other, the one containing a charge of fine powder inserted into the vent of a gun, and the other containing a friction composition of antimony sulphide and potassium chlorate within which is imbedded a copper wire flattened and roughened at one end. When this wire is withdrawn quickly by the lanyard the composition is ignited and sets fire to the powder in the vent tube which communicates fire to the charge in the gun. The electric primer consists of two insulated copper wires joined by a small platinum wire. The junction is imbedded in some dry gun-cotton and inclosed in a copper tube containing also some small-arms powder. When the circuit is closed ignition occurs. To prevent erosion of the vent an obturating device, which prevents the escape of the powder gas, is now generally added to both primers.

Primero. English 16th century game of cards of the poker family.

Prime Vertical. Vertical circle whose plane is perpendicular to the meridian. It passes through the east and west points.

Primine. Outer layer of cells of the ovule which in ripening forms the testa of the seed.

Priming. Foaming or frothing of the water at its surface in a steam boiler, by which the entrainment of water into the cylinder is effected. Dirty or greasy waters are most liable to this difficulty, and it is favored by having insufficient disengagement area for steam from water surface, by defective circulation, by too high water level within the shell, by too small a size and too high velocity of current in the dome, and by heavy driving of a small boiler. Excessive priming of water endangers the cylinder when the entire living force in the fly-wheel and reciprocating parts is arrested by incompressible water which more than fills the clearances; it is uneconomical to exhaust water which has been heated but has no expansive energy in the cylinder; and it increases the losses from re-evaporation when the water is evaporated during the fall of pressure due to expansion, and takes heat for this change from the working steam and from the cylinder walls.

Primitive. First, plutonic and metamorphic rocks; afterward, any crystalline formation.

Primitive Groove (AND STREAK). First signs of an axis on the embryonic shield in the developing egg of birds, mammals, etc. The groove is the representative of the blastopore, the streak is the thickened edges of the elongated blastopore. The medulary folds and groove appear anterior to these structures.

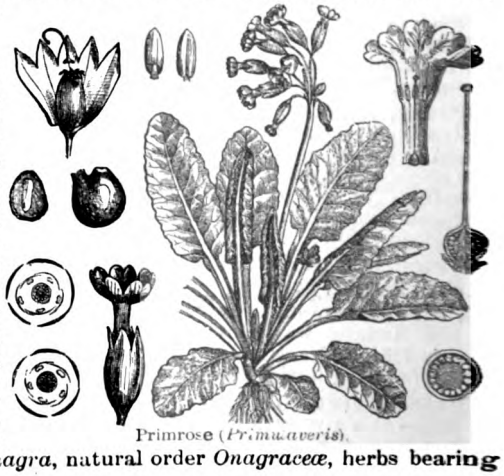
Primogeniture. Common-law rule of descent, by which the eldest son inherits to the exclusion of other children; not adopted in the U. S.

Primordial Cranium. See CARTILAGINOUS CRANIUM.

Primordial Utricle. Exterior portions of protoplasm in plant cells.

Primordial Zone. Barrande's lowest fossiliferous strata, now included in the Cambrian.

Primrose. Showy-flowered herbs of genus *Primula*, natural family *Primulaceæ*, natives of the n. temperate zone, much planted for ornament. Except a slight acridity, they are of no economic importance beyond the beauty of their blossoms.



Primrose (*Primula veris*).

Primrose, EVENING. Plants of the genus *Onagra*, natural order *Onagraceæ*, herbs bearing

showy yellow or red flowers, several species of which are night-blooming; natives of N. and S. America.

Primrose League. English conservative political society, founded Nov. 1883. Lord Beaconsfield was fond of flowers, and especially of the primrose. After his death it became the emblem of the principles he represented. The society has ab. 1,000,000 members of both sexes.

Primulaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising ab. 25 genera and 315 species, very numerous in the temperate regions of the n. hemisphere; called the Primrose family.

Primuline. Yellow azo dye-stuff, which combines with cotton and then can be acted upon by phenols, producing insoluble colored compounds on the fiber.

Primum Mobile. In the Ptolemaic Astronomy, imaginary crystalline sphere revolving from east to west every 24 hours, carrying with it the spheres of the planets and fixed stars.

Prince. English noble ranking above a viscount, but practically princes of the blood are the only ones so designated. On the Continent, there are princes who are not related to the ruling families.

Prince, THOMAS, 1687–1758. Pastor at Boston from 1718; reviser of the *Bay Psalm Book*, 1758. His *Chronological History of New England*, 1736–55, extends only to 1633.

Prince Edward Island. E. of New Brunswick; discovered 1497; held by Gt. Britain since 1764; now part of the Dominion of Canada. Area 2,133 sq. m.; pop., 1891, 109,088.

Prince of Wales Land. Large island of N. America, in the Arctic Ocean.

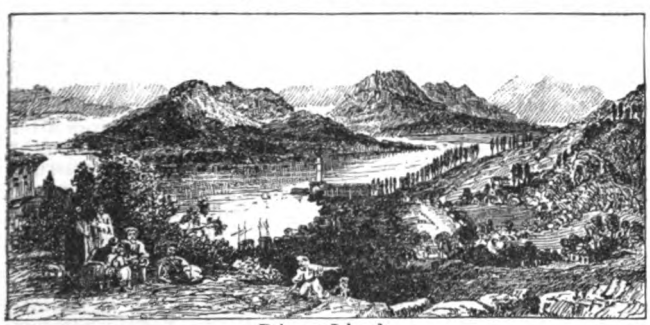
Prince Patrick Island. N. America; in Arctic Ocean.

Princeps. Civil title of the Roman emperors.

Prince Rupert's Drops. Drops of glass which have fallen in a melted state into cold water and have assumed a tadpole-like shape. When the point of the tail is broken off the whole of it will burst into small pieces with a loud explosion, due to tension from the rapid cooling.

Prince's Feather. *Amaranthus caudatus.* Crimson-flowered plant of the natural family *Amarantaceæ*, and *Polygonum orientale*, a rose-flowered plant of the *Polygonaceæ*, both natives of the Old World, but widely cultivated in gardens.

Princes Islands. Group in the e. of the Sea of Marmora, 13 m. s. of Constantinople, near the coast of Asia Minor, con-



Princes Islands.

sisting of 9 islands, the largest being Prinkipo and Khalki. Visited by many for the beauty of their scenery and agreeable climate.

Prince's Pine. See PIPSISSEWA.

Princeton. Borough of Mercer co., N. J.; seat of a famous college. The British were defeated here by Washington Jan. 3, 1777. Pop., 1890, 3,422.

Princeton Theological Seminary. Presbyterian, founded 1812, professors 9, students 300, library 47,000.

Princeton University. At Princeton, N. J.; assumed its present name at the sesquicentennial celebration of the "College of New Jersey," chartered in 1746. During the Revolutionary war Nassau Hall was occupied by both Colonial and British troops, and the Continental Congress met in it in 1783. Within 20 years the college has received gifts amounting to $4,000,000. In 1896 there were 82 instructors, 1,045 students, and 185,000 volumes in the various libraries. Number of alumni, 7,493.

Principal, IN ETHICS. Person who commits an offense or takes such part as makes him equally guilty with the prepetrator.

Principal Axis of a Conic. That passing through the foci.

Principal Plane. That of a surface of the second order is one which bisects systems of parallel chords of surface at right angles.

Principal Planes. See CARDINAL POINTS.

Principle of Archimedes. See ARCHIMEDES, BUOYANCY, CENTER OF BUOYANCY, and METACENTER.

Principle of Least Action. Suppose any dynamical system to move unconstrained from one given position to another, then the actual motion is such that $\int E\,dt$ [t refers to time] is less than if the system were constrained, without violating any geometrical conditions, to move in some other manner from the one position to the other with the same energy, provided that these other motions be such throughout that E (energy) is the same function of the coördinates and their differential coëfficients. This is the principle of least action.

Principle of Least Squares. See LEAST SQUARES.

Principle of Moments. One which applies to the equilibrium of any rigid body when acted upon by any system of forces. It may be stated as follows: that a rigid body may have no motion of rotation, it is necessary and sufficient that the algebraic sum of the moments about any three mutually perpendicular axes of all the forces acting upon it shall be separately equal to zero. See MOMENT.

Principles, IN ETHICS. Accepted laws of action or rules of conduct, as those of the Stoics.

Principles, MILITARY. Armies are bodies of men, equipped with weapons and organized for combat, command and supply. The general rules for combat form the principles of the military art and are laid down in the text-books and taught in the schools: they are derived from experience, and are subject to the modifications which experience and progress suggest. The theory of organization rests upon a system of individual responsibility, discipline and subordination, based on the controlling idea that there is but one sole responsible commander of the forces of the nation, and that he is the Head of the State. Under him is a system of subordinate commanders, called the military hierarchy, each of whom has specific duties and powers in his own particular sphere of command.

Principles of Action, IN ETHICS. Human affections, desires, and dispositions, as they act in a steady and consistent manner in influencing actions.

Pringle, THOMAS, 1789–1834. Scottish poet and journalist. *Ephemerides*, 1828; *African Sketches*, 1834; *Works*, 1839.

Pringsheim, NATAN, 1823–1895. Prof. in Berlin. *Untersuchungen ueber den Bau und die Bildung der Pflanzenzelle*, 1854; *Ueber die Befruchtung und Keimung der Algen*, 1855–57.

Printer's Ink. See INK.

Printing, INVENTION OF. The Assyrians and Egyptians applied stamps engraved in relief to plastic clay, but failed to develop and apply the art which had almost revealed itself to them. Practical use was first made of the principle by the Chinese, probably in the 2d century. Printed books were common among them in the 10th century, and the use of wooden blocks for their production may be traced back to the 6th cent-

Invention of Printing—Gutenberg, Fust, and Schoeffer examining the First Proof.

ury. The earliest example of block-printing in Japan dates from ab.765, and a "printed" book (brought from China) is definitely named in a journal of 987. Movable types (of clay) are said to have been employed by the Chinese from ab.1050. The Coreans used them 1337, and are believed to have invented copper types early in the 15th century. There is no evidence that these inventions were communicated to Europeans. When block-printing first appeared in the West is unknown, but its

products were abundant in Germany and Holland ab.1400. Impressions seem to have been taken in the 12th century on cloth and vellum, and on paper ab.1375. In these blocks the letters and illustrations were exhibited in relief as in wood-engraving. The only apparatus needed was the blocks, ink, and a rubber to press the paper upon the type. The earliest dated woodcut now in existence is of 1423. Of this style of printing in Germany 20 examples are extant, containing 7 to 50 leaves each, while the Netherlands furnish 10 more. The earliest work done with movable types which has come down to us with authentic date is of 1454, Nov. 15, being copies of letters of indulgence printed, as is believed, at Mainz. Here at this time were two rival printers, one of whom may have been Johan Gutenberg (aided perhaps by the money of Johan Fust), and the other Peter Schoeffer. Albrecht Pfister was printing in the same city in Feb. 1461, and is supposed to have produced various books which appeared in 1455, 1457, and after, among them a Bible in 2 vols. folio, which is believed to antedate 1461. The Mazarine Bible was completed before Aug. 15, 1456. Gutenberg was printing 1460, and probably continued till his death in 1468. From Mainz the new art spread to other cities. Printing offices were in operation in Bamberg 1461, Subiaco 1465, Cologne 1466 (1463?), Eltville and Rome 1467, Augsburg, Basel, and Marienthal 1468, Venice 1469, Nuremberg and Paris 1470, Westminster (Caxton) 1477, Edinburgh 1505, Dublin 1551, Mexico 1540, Lima 1584, Cambridge, Mass., 1638, New York 1693. By 1500 the art was practiced in 220 different towns. As to the place and date of the invention of movable metal types there has been much controversy, some placing it in 1430 and even earlier; but it is generally agreed that Haarlem was the place, and Lourens Janszoon Coster the inventor, probably ab.1445. Gothic type or black letter was first employed; Roman type appeared ab.1464; Venetian, Aldine, or Italic type was introduced by Aldus Manutius of Venice 1500; a rude Greek type first appeared 1465, Hebrew 1475, Anglo-Saxon 1574, music type 1495. Printing for the blind was first used in Paris 1784; in raised characters, in Edinburgh, 1827. See PRESS, PRINTING.

Prior AND **Prioress.** Assistant of an abbot or abbess, or head of an inferior monastery, sometimes dependent on an abbey.

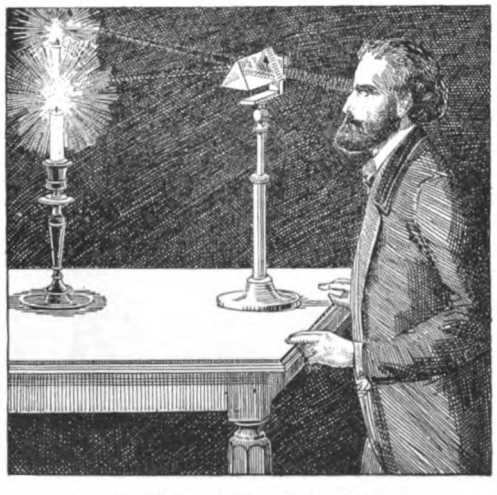
Prior, MATTHEW, 1664–1721. English poet and diplomatist, notable for wit and epigram; M.P. 1701; imprisoned 1715–17. *Works*, 1709–18–40.

Priscian, 6th cent. Latin grammarian, long at Constantinople in the pay of the Greek empire. His *Commentariorum* and some other works are extant.

Priscianus, THEODORUS, 4th cent. Medical writer at Constantinople. His book was pub. 1532.

Priscillian, d.385. Spanish bishop, irregularly consecrated; excommunicated 381; first victim of a trial for heresy; founder or head of an ascetic Gnostic sect which survived till ab.563. Some writings of his came to light 1885.

Prism. Polyhedron having two parallel and equal polygons as bases, and its other faces parallelograms whose bases are the equal and parallel sides of the equal polygons: right when lateral edges are perpendicular to base: regular when its bases



Images of objects seen through Prisms.

are regular polygons: classified according to bases as triangular, quadrangular, etc. An optical prism is a portion of a transparent medium bounded by at least two inclined plane surfaces. The diedral angle between the plane faces is called the refracting angle of the prism. Prisms are usually made of glass, and are used to deviate a ray of light and also to disperse composite light into its various colors. See ANGLE OF DEVIATION and MINIMUM DEVIATION.

Prismoidal Formula. Let l be the length of a solid, A_1 and A_2 its end areas, and M the area of a section half way between them. Then the cubic contents is

$$C=\frac{1}{6}l(A_1+4M+A_2).$$

This formula applies to solids bounded by plane or warped surfaces or by curved surfaces generated by conic sections. It is extensively used in earthwork computations.

Prison. General term for all the various buildings maintained for the confinement of persons in judicial custody. They have been in use from early times, being mentioned in the Bible. In ancient times prisons were very unhealthy, generally being low and filthy. The prisons of the Inquisition were places of cruel and protracted punishments.

Prison Discipline. There are three systems in operation for the proper care and regulation of prisoners. 1. The Auburn or Congregate Silent System. In this system, which is almost universal in the U. S., the prisoner is separated from the other prisoners by night and in daytime work together in silence. 2. The Philadelphia or Separate Cell System. This is practiced in the Eastern penitentiary at Philadelphia, which is the only State prison using it. Other prisons in Pa. and those of Belgium use it in a modified form. In this the prisoner is always isolated in recreation and work. It has proved unsatisfactory. 3. The System of Progressive Classification. This was originated by Capt. Alexander Maconochie in 1840, while in charge of the British penal colony of Norfolk Island. In this the convict is treated as a laborer, and receives a certain amount for his work, and whatever he saves out of his earnings helps toward reducing his term of imprisonment, and by this means trains the convict to habits of industry and frugality. The men are not sentenced to a term of years, but are fined; the fine has to be paid by what he earns above his keep. The prisoner's fate is in his own hands, and after reaching a certain stage they are promoted and allowed to form partnerships, etc. Idleness and bad conduct thus keep him in a condition of restraint. This system was carried to Ireland by Walter Crofton, and is sometimes called the Irish or Crofton System. Reformatories have been established in nearly all the States using the general principles of this system.

Prisoner's Base. In this game from six to ten players on a side take part. These sides are chosen by two captains. Two inclosed spaces side by side are marked out, large enough to hold all the players: these are called the Home Bases. From 100 to 200 ft. away are marked out two other similar spaces, called Prison Bases. All the players take their places in the Home Bases, each side in its own. Then a leader goes out, and when perhaps half way toward the Prison bases, calls out "Chase!" One of the other side goes after him and attempts to touch him before he can return home. One of the leader's side goes after the second man, and so on: the one leaving last cannot be caught by one who has left before him, but may be in turn pursued by a player leaving later. When a man is caught he is taken to the Prison Base. So the game continues until one side has made prisoners of all its opponents. If a home base is left unoccupied, it may be taken possession of by an opponent.

Prisoners of War. Military persons captured by the armed forces of a nation, when engaged in the legitimate exercise of their profession. They are deprived of their liberty and subjected to such treatment as is provided for by the laws of war, until they are duly exchanged or otherwise regain their liberty.

Privateering. Waging hostilities by means of private ships. Modern international law discountenances the practice, and most European states have expressly consented to its abolition.

Private War. Right of each individual in primitive societies to obtain justice for and punish injury to himself by force of arms, instead of appealing to a government which acts as the guardian of justice.

Private Wrongs. Injuries inflicted upon another person, not violently but under the guise of law and good order.

Privet. *Ligustrum vulgare.* Shrub of the natural family *Oleaceæ*, native of Europe, planted for hedges, and introduced into N. America; also called Prim.

Privileges. 1. Of legislators, secured by modern constitutions. 2. Of citizens.

Privy Council. In England, formerly a portion of the king's council, selected by and attendant on the sovereign; at present a body of ab. 200, some of whom exercise judicial functions, others, with the crown, possess legislative powers, and still others, organized in committees, exercise only administrative functions.

Privy Seal. In Great Britain, subsidiary to the great

Great Seal of William the Conqueror.

seal; used on state papers; kept by a cabinet minister, who at one time was called the Keeper and now the Lord Privy-seal.

Prize. Vessel seized at sea and condemned in an admiralty or other court. Prize-money comes from the sale of such a ship, and is divided between the officers and men who took it.

Proa. Malay vessel of canoe shape, with one large sail; formerly dreaded from their piratical character.

Proamonin. That part of the amniotic fold which surrounds the head in mammalian embryos. It consists of epiblast and hypoblast, but no mesoblast.

Probabilities. Term applied by Prof. Cleveland Abbe to his daily weather predictions 1869, in Cincinnati; adopted 1871 by Gen. Myer, for the official predictions as made at Washington; also by Prof. Abbe for the Signal Office. It had been similarly used by Le Verrier in Paris since 1859, and was supposed to suggest that the so-called predictions were really but a statement of probabilities as to the coming weather.

Probability. Likelihood; amount of expectation below certitude; possessed of infinite degrees.

Probability, MATHEMATICAL. Ratio of the chances in favor of the happening of a certain event, to the number of chances both for and against it. The theory of probabilities treats at length the determination of this probability under various conditions.

Probable Error. In a physical experiment the arithmetical mean of the results of a series of observations is in general the most probable value of the quantity to be determined; and the most probable error of a single observation, as well as that of the result, can be found by the following rule. Let δ denote a difference between the mean and a single observation; δ will in general have n values if there are n different observations: then

$$\text{mean error of a single observation} = \sqrt{\frac{\Sigma(\delta^2)}{n-1}},$$

$$\text{" " " the result} = \sqrt{\frac{\Sigma(\delta^2)}{n(n-1)}},$$

$$\text{probable error of a single observation} = \pm 0.6745\sqrt{\frac{\Sigma(\delta^2)}{n-1}},$$

$$\text{" " " the result} = \pm 0.6745\sqrt{\frac{\Sigma(\delta^2)}{n(n-1)}}.$$

Probang. Rod of whalebone or other flexible material used in the diagnosis and treatment of the diseases of the pharynx and esophagus. It is sometimes tipped with a ball varying in size to dilate strictures, or it may have a sponge on the extremity for the purpose of applying medicine topically.

Probate Courts. Court having general probate jurisdiction; that is, to take proof of wills, to issue letters testamentary, letters of guardianship, of administration, and cognate matters.

Probation, FUTURE. Doctrine that for some souls, especially such as have not known Christ here, the opportunity of regeneration may be given hereafter. See PUNISHMENT, FUTURE.

Probity. General uprightness, especially in the sense of respect for the rights of property.

Problem OF THE THREE BODIES. To find the paths described by three bodies (as the earth, sun, and moon), acted upon only by their mutual attractions; famous in the history of celestial mechanics. No strictly general solution has ever been found.

Proboscidia (CHELOPHORA). Order of Subungulates, including the Elephants. The skin is thick and sparsely haired, the nose is prolonged into a long proboscis, with the nostrils opening at end. The feet are five-toed, some of which carry hoofs. There is a pad-like sole, and the legs are stout, with vertical femur. In living elephants there are no lower incisors, and the two upper incisors grow from permanent pulps and constitute the tusks. There are no canines and only a few large, transversely ridged, and tuberculate molars. Clavicles are absent; there is no scrotum; the two mammæ are pectoral, and the placenta is deciduate and zonary. The brain cavity is small; the huge skull is principally made up of vast air sinuses in the bones. The tusks are preceded by "milk-tusks." The molars cut the gum from before backward, so that only two or three are in use at one time; when a new one is added behind, the front one is lost. The period of gestation is more than twenty months. Elephants are monogamous, gregarious, and strictly phytophagous. The Miocene period furnishes fossil forms known as the Deinotherium; the Pliocene furnishes the Mastodon, and in Quaternary and recent times flourished the Mammoth. See ELEPHANT.

Probus, MARCUS AURELIUS. 232-282. Roman emperor 276, with Florian for rival at first; victorious over Germans, Sarmatians, and Persians. Eminent as general, ruler, and patriot. Bred to the sword, he dreamed of restoring the ancient liberties, and checking the dangerous power of the army. His conquests finished, he set the soldiers to work on roads and other public improvements, and was slain in a momentary tumult. His coinage is the most varied and beautiful of the later empire.

Probus, MARCUS VALERIUS, 1st cent. Syrian editor of Latin classics at Rome.

Procambium. Young cells of fibro-vascular bundles in plants, before they are differentiated into phloëm and xylem.

Procamelus. See POEBROTHERIUM.

Procarp. Female organ of certain *Algæ* before fertilization by the pollinoids.

Procedure. Body of legal rules regulating the pleadings and proceedings in litigated cases.

Procelariidæ (PETRELS). Family of longipennate Natatores, with three toed, webbed feet, and the upper mandible of the beak strongly hooked. They resemble Gulls. The plumage is somber, the nests are on rocks, the male and female take turns at incubating the single egg. The smaller petrels are known to sailors as Mother Carey's Chickens. They fly at dusk or at night. The Albatross is a gigantic member of this family, some having a spread of wings equal to 15 ft.

Procephalic Lobes. Two eminences at the front end of the ventral plate, from which the eyes and cerebral ganglia develop in Arthropods.

Process. Instrumentality by which a court enforces its will.

Procession of the Spirit. The Nicene-Constantinopolitan Creed of 381 derived the Holy Ghost "from the Father." The Latin Ch., following the teachings of St. Augustine, in 589 added *filioque*, "and from the Son." To this the Greeks would not agree: much controversy ensued, and the schism remains.

Processus Falciformis. Vascular process of the choroid into the eyeball in fishes and reptiles. It corresponds to the pecten of birds.

Prochein Ami. Next friend. Person by whom an infant or a married woman may bring suit or do other acts on behalf of an infant, such as are authorized by law.

Proclamation of Emancipation. See EMANCIPATION, PROCLAMATION OF.

Proclus, 411-485. Greek philosopher of the Neo-Platonic school at Athens. He held devoutly to a multitude of deities, and was once banished for his attacks on Christianity. His surviving works are numerous; some were edited in 6 vols. 1820-27, and some were tr. 1788 and later.

Procne. Wife of Tereus. See ITYS.

Procœlia (existing CROCODILIA). They have procœlous vertebræ, a compressed tail, effective for swimming, and bearing in front a double crest of plates, but single behind; the front feet have five, the hinder have four, webbed toes. They live in the mouths of rivers of tropical parts of both hemispheres, lay eggs with hard shells in the sand on the shore, leaving them to be self-incubated, though the female keeps watch from a distance. They hunt their prey at night, which consists of animals living in or near the water. Three families are included. See GAVIALS, CROCODILES, and ALLIGATORS.

Procœlous. Vertebræ having the anterior faces hollow and the posterior convex, to fit into the concavity of the next succeeding vertebra, as in Frogs.

Proconsul. Roman officer governing a province.

Procopius, d. ab.565. Byzantine historian and secretary of Belisarius, whom he accompanied through his Italian campaigns; made senator and prefect of Constantinople by Justinian. His histories of the wars with Persians, Vandals, and Goths, in 8 books, tr. 1653, is highly valued. *Anekdota*, tr. 1674.

Procopius, ANDREW, 1380-1434. Hussite (Taborite) general, succeeding Ziska 1424; victor in many battles; leader in the vengeful and destructive attacks on countries around Bohemia,

"obsequies of Huss"; prominent at the Council of Basel 1433; killed at Lipau, in conflict with the Calixtines.

Procoracoid. See PRECORACOID.

Procrustes. Legendary robber of Attica, who fitted his victims to a bed by lopping the limbs of such as were too long and stretching those who were too short.

Procter, BRYAN WALLER ("BARRY CORNWALL"), 1787–1874. English poet, biographer of Kean, 1835, and Lamb, 1866. *Dramatic Scenes*, 1819: *Mirandola*, a tragedy, 1821; *Songs*, 1832. —His daughter, ADELAIDE ANNE, 1825–1864, was yet more successful in verse. Her *Legends and Lyrics*, 1858–60, are eminently sweet and pure, and largely devotional.

Proctodæum. Invagination in the embryo which develops into the cloaca.

Proctor. Attorney in admiralty courts and in English ecclesiastical courts.

Proctor, A. PHIMISTES. b. 1867. American sculptor, noted for his work on the animals on the grounds of the World's Columbian Exposition, Chicago;—polar bear, elk, deer, etc.

Proctor, EDNA DEAN, b. 1838. American poet.

Proctor, HENRY A., 1787–1859. English officer, defeated by Gen. Harrison at the Thames, Ohio, Oct. 5, 1813.

Proctor, LUCIEN BROCK, b. 1826. Author of sundry books of N. Y. legal history and biography.

Proctor, REDFIELD, b. 1831. Gov. of Vt. 1878; U. S. Sec. of War 1889–93.

Proctor, RICHARD ANTHONY. 1837–1888. English popularizer of astronomy; founder of *Knowledge*, 1881; author of 57 books. *Saturn*, 1865; *Other Suns than Ours*, 1887.

Procurator. Roman officer who managed the imperial revenue in a province; sometimes charged also with the civil administration, as Pilate in Judæa.

Procyon = α-CANIS MINORIS. First magnitude star; right ascension = 7h. 33m. 29s., declination = 5° 30′ 32″ N. The parallax according to Anwers is 0.123″, or the time required for light to pass from the star to the earth 26.5 years.

Procyonidæ. Family of *Arctoidea*, including small American bear-like carnivores. They differ from Bears in having a larger tympanic bulla and one molar less on each side of the

Kinkajou (*Cercoleptes caudivolvulus*).

mandible. The Kinkajou, the S. American coon-bear, resembles a cat, yellow in color, with tail long and prehensile. It shuns the light, lives in trees, and feeds on honey. The RACCOON (q.v.) is another example.

Producer Gas. Made by passing a limited stream of air through glowing coke; the coke burns to carbonic acid, and this, passing through the remainder of the glowing coke, takes up carbon and becomes largely carbonic oxide. It is employed in firing boilers, heating the furnaces in metallurgical operations, in glass and pottery making, etc., and offers a remedy for the imperfections of the ordinary fire and fuels. In the Siemens gas producer, the fuel is converted into a mixture containing 30.5 CO, 2.5 H, 4 CO_2, 59.5 N, and 3.5 CH_4. The air and gas, after passing through a system of regenerators, meet in the furnace itself, combustion ensues, and intense heat is produced. The usual yield in the Siemens producer from bituminous coal is ab. 160,000 cu. ft. and from coke ab. 175,000 cu. ft. per ton, or ab. 60–68 per cent of the respective materials employed.

Producer's Goods. Such as satisfy wants only indirectly, by contributing toward the production of such goods as directly satisfy them.

Producer's Rent, or SURPLUS. Amount which the possessor of any rare or exceptional natural facilities for the production of a thing receives over that received by producers who have no special facilities.

Product. In Mathematics, result of combining two or more quantities as factors.

Production of Wealth. Creation of values; all those acts by which an article comes to give its possessor the power of demanding in exchange for it the labor or results of the labor of others; first great division of the study of political economy.

Productive Agents. Primary agents in the production of wealth; viz., land, labor, and capital.

Productive Labor. Such as is directed to the creation of the means of production, and of lasting sources of enjoyment; as distinguished from that which gives personal services or creates ephemeral luxuries.

Proembryo. Chain of cells produced in the nucleus of an ovule after fertilization by the pollen tube; resulting from the repeated division of the cells of the embryonal vesicle or corpuscula; known also as the Suspensor.

Profert and Oyer. Practice of proffering a written instrument as a cause of action and desiring an inspection before pleading.

Professional. In Athletics, one who has competed for a money prize or staked bet, or with or against a professional for any prize, or who has taught, pursued, or assisted in the practice of athletic exercises as a means of obtaining a livelihood.

Professor. Officer in the higher institutions of learning who instructs students or teaches by lectures; used in a loose sense to denote the teacher of any science. It is also used by instructors in boxing, dancing, etc.

Profile. Drawing of the outline of an object; or showing the curve of intersection of the surface of the ground with a vertical plane; made in order to establish the grade of a road or sewer.

Profile Paper. Paper ruled with horizontal and vertical lines, and used for plotting profiles.

Profit à Prendre. Mere rights of convenience without profit, while EASEMENTS (q.v.) are rights of profits.

Profits. That part of the product of industry which goes to the business employer; amount of return from a business operation after rent, wages, and interest are deducted.

Profit-Sharing. See INDUSTRIAL PARTNERSHIP.

Proglottis. One of the segments of a tapeworm, which, when the eggs with which it is filled become ripe, is detached from the rest of the body.

Prognathi. Division of mankind having skulls with prominent jaws and teeth, as in most savage races. They have a low facial angle. See MAN.

Prognosis. Opinion regarding the outcome of any disease or case of sickness.

Prognostics. All features that indicate coming changes in the weather. Large collections of popular prognostics from the animal and vegetable phenomena have been published; but those used by meteorologists are based on the study of the clouds and weather maps, and not on myths.

Programme Music. Instrumental music designed to depict natural scenes, incidents, events, or emotional processes, to which the composer gives the clew by means of a descriptive title or a motto.

Progressive Taxation. Taxation so calculated that the larger the income or the bequest, the larger the proportion, as well as the actual amount, taken by the government.

Prohibition Party. In 1857 the Independent Order of Good Templars declared it to be one of its cardinal purposes to elect men to office who were against the liquor traffic, and the outcome of a meeting of the Grand Lodge of this order, at Oswego, N. Y., May, 1869, was the naming of a committee, which called a convention at Chicago, 1869, for the purpose of organizing a National Prohibition Party. One of the essentials of their platform always is a clause against the liquor traffic. Their first national convention was held in Columbus, Ohio, 1872. James Black was nominated for President and John Russel for Vice-President. Electoral tickets were placed in six States and they received 5,607 votes. In 1896, Bidwell, the Prohibition nominee, received a popular vote of 264,133.

Projectile. Body thrown in any direction and in general acted on by the force of gravity. Its path is called its trajectory. The greatest horizontal distance it can traverse is called its range. If we neglect the resistance of the air, the path of a projectile may be shown to be a parabola. In practice, however, it varies widely from this curve, on account of friction; it is somewhat straight at the start, and ends with a rather

abrupt fall. This friction varies approximately as the velocity when the latter is small, but more nearly as the cube of this for velocities like that of a cannon ball. To obtain the maximum range, if we neglect the air resistance, the angle of projection should be 45° with the horizon.

Projectiles. Modern projectiles are classified, according to their structure, into solid shot, shell, and case shot: to their use, into small arms, field, siege, and seacoast projectiles: and to their shape, into spherical and oblong. Spherical projectiles are rapidly becoming obsolete. The only solid projectiles are now those for small arms. Elongated chilled cast-iron cored shot and chrome steel forged and tempered shot are designed for armor piercing: these have a closed hollow interior. A shell is a hollow elongated projectile containing a bursting charge of gunpowder or high explosive, with a fuse to ignite it at any desired point in its flight. The 12 in. deck-piercing shell and 12-in. mortar shell are of forged steel carrying heavy bursting charges of high explosives: the 5-in. siege shells are similar to these and are used for both direct and curved fire against earthen parapets and masonry structures. The field shells, 3.2-in. and 3.6-in., are designed to burst into many fragments and have sufficient remaining velocity to destroy men and material. Modern shrapnel consists of a wrought-iron tube with cast-iron base, the tube filled with bullets, held in place by a skeleton matrix of cast iron, and a bursting charge. See HOTCHKISS PROJECTILES.

Projectiles, PENETRATION OF. The following data pertain to modern projectiles of the U. S. Service:

Gun.	Muzzle velocity.	Muzzle energy.	Penetration into steel at muzzle.	At 3,500 yards.
3.2-in. field.	1,685 f.s.	266 ft.tons.	3.8 in.	
3.6 " "	1,550 "	333 " "	3.9 "	
5.0 " siege.	1,830 "	1,045 " "	6.2 "	2.5 in.
7.0 " siege how'zer.	1,085 "	857 " "	3.8 "	2.4 "
7.0 " siege mortar.	690 "	412 " "	2.2 "	
8.0 " seacoast.	1,950 "	7,907 " "	16.0 "	10.6 "
10.0 " "	1,975 "	15,548 " "	20.4 "	14.6 "
12.0 " "	2,100 "	30,570 " "	27.1 "	20.6 "
16.0 " "	1,975 "	64,084 " "	33.8 "	27.5 "
12.0 " s.c. mortar.	1,140 "	7,207 " "	9.7 "	

Projection. Development with greater or less distortion of the spherical surface of the earth on a plane. That in most general use is the polyconic, which consists in the development of a series of cones, tangent to the earth's surface on parallels of latitude. In some cases a single tangent cone is employed, points upon the earth's surface being projected upon the cone by means of radial lines from the earth's center. The secant cone projection consists in the development of a cone which cuts the earth's surface in two parallels of latitude. The MERCATOR PROJECTION (q.v.) is the development of a cylinder. Many other projections more or less arbitrary are in use.

Prolapsus Ani. Protrusion of the walls of the rectum through the anus.

Prolapsus Uteri. Falling of the womb from its normal position toward the floor of the pelvis, or even beyond so that it extrudes either partially or entirely through the vulva.

Prolate Cycloid, or TROCHOID. One in which the generating point lies within the rolling circle; determined by the equations

$$x = r(\varphi - m, \operatorname{Sin} \varphi)$$
$$y = r(1 - m, \operatorname{Cos} \varphi) \text{ when } m > 1.$$

Prolegs. Abdominal feet of caterpillars.

Proletariate. Originally, mass of the lower classes of Rome; now, a class entirely without productive property, especially the laboring class in the cities.

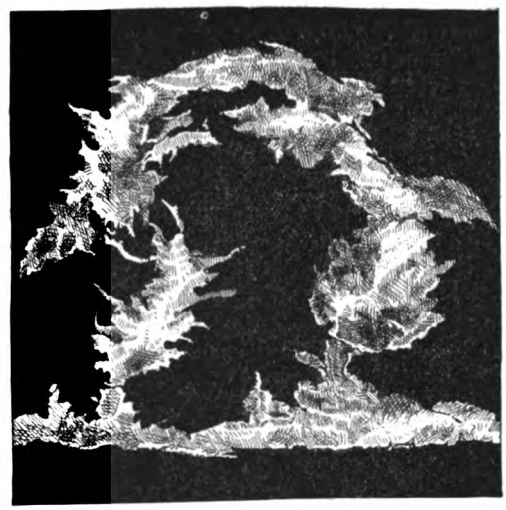
Proliferation. Production of buds, and consequently flowers or branches, in unusual positions.—In Zoölogy, cell-multiplication in tissues.

Prolification. Extension of a floral axis beyond or through a flower, sometimes bearing another flower, or tuft of leaves.

Prologue. Introduction to a discourse. The discourse or poem spoken before a dramatic performance, corresponding to the EPILOGUE (q.v.) at the end.

Prometheus. One of the Titans, benefactor of mankind, who brought fire from heaven in a reed, taught men useful arts, and was chained to a crag on Mt. Caucasus, where an eagle gnawed his liver, but was at last released by Hercules.

Prominences, SOLAR. Projections rising above the general surface of the sun, sometimes to a height of 30,000 or 40,000 m. They become visible in a total eclipse of the sun, and are shown by means of the spectroscope. They are composed largely of hydrogen.



Solar Prominences.

Promise. Intention expressed by one person to another to do some action in the future, the person promised being likely to regulate his actions according to this expectation.

Promissory Note. Writing by which the signer unconditionally promises to pay a certain sum of money to another at a determinable future time.

Promorphology. Science of the causes of the morphological structures in living things, or the speculation concerning the types or geometrical ideas expressed in animal groups. These types are the different forms of SYMMETRY (q.v.); also the different sorts of MEROMORPHISM or MEROGENESIS (q.v.)

Promotion. Elevation of a military person to a higher rank than that which he then holds. With some exceptions, it is by seniority in the U.S. Service.

Promycelium. First growth from the spores of certain *Fungi*.

Pronephric (ARCHINEPHRIC) **Duct.** See PRONEPHROS.

Pronaos. In Classic Architecture, that part of a temple in front of the outer wall.

Pronephros. Head kidney of larval vertebrates, especially of fishes. In the Fowl it extends from the seventh to the eleventh somites, counting from the front. Its duct is the archinephric, which has one or several nephrostomata at its anterior extremity; posteriorly it empties into the cloaca.

Prong-Buck. Antelope of the Rocky Mts., having a short prong on the front of its horns, belonging however only to the sheath, which is cast every autumn (the rutting season).

Prong-Buck (*Antilocapra americana*).

The horns are rudimentary in the female. In color these fleet-footed animals are yellowish brown, with white buttocks; no dew-claws are present. Length 4½ ft., ht. 2½ ft.

Pronotum. Dorsal or tergal portion of the prothorax of insects.

Pronouns. Words which do or may take the place of nouns; long classified as personal, relative, and adjective.

Pronuclei (MALE and FEMALE). Nuclei which unite in the fertilized egg to form the segmentation nucleus. The female pronucleus is formed, after the polar globules are extruded, from the remnant of the germinal vesicle. The male pronucleus is formed principally from the head of the spermatozoön; it represents a portion of the nucleus of the cell which was metamorphosed into the spermatozoön.

Pronucleus. In Botany, nucleus of a conjugating cell.

Proof. Sometimes any method of establishing certitude, whether intuitive, ratiocinative, or experiential; sometimes deductive or syllogistic method, called probation: the latter is exclusively logical or ratiocinative, and the correct technical use of the term; but it establishes no certitude which does not already belong to the premises.

Proof of Death. The most reliable indications that life is extinct are the glary eyeball, with the pupil fixed in dilation, rigidity of limbs, and cadaveric discoloration by surface pressure.

Proofs for the Press, CORRECTION OF.

WILLIAM FALCONER.

Caps.[1]

[2] S. Caps. *William Falconer* was the son of a ¢ barber in [4] a/ Edinburgh, ¢nd was born in 1730. He had very few [6] d/ avantages of education, and (went to sea (in early life) in the merchant service. He afterwards became mate [6] was/ of a vessel that wrecked in the Levant and was saved [9] ⊙ with only two of his crew: ¢his catastrophe formed [25] Lead the subject of his poem entitled "The Shipwreck, on [12] × which his reputation as a writer chiefly rests. Early [13] wf. in 1769, his "*Marine Dictionary*" appear ⌒ed, which [16] # hasbeen highly spoken of by those capable of estimating its merits.

[6] same/ (In this ~~seam~~ year, he embarked on the AURORA but the vessel was never heard of after she passed the [4] :/ Cape; the poet of the Shipwreck is therefore sup- [4] e/ posed to have perish'd by the same disaster he had [27] Stet ~~himself~~ so graphically described. ¶ The subject of [21] ___ the "Shipwreck" and its authors fate demand our [21] ___ interest and sympathy. If we pay respect to the ingenuous scholar who can produce agreeable verses in leisure and retirement, how much more interest must we take in the "shipboy on the high and giddy [23] [11] ⌄ mast', cherishing the hour which he may casually snatch from danger and fatigue.

refined visions of fancy at/ [6]

Caps.[1]
Q[3]
9[5]
tr.[7]
Ital.[8] ,/[6]
T/[4] T[10]
⌄[11]
Room.[14] ⌒[15]
—[17]
No break.[18]
l. c.[19] ;/[4]
Space better[26]
¶[20]
⌄[11]
/—/[22]
i/[4]
Q Lead[24]
/-/[22]
!/[6]

1. Alteration of type. 2. Small caps. One line is drawn under the word for *italics*, two for SMALL CAPITALS, three for CAPITALS. 3. A word or letter to be deleted. 4. A wrong letter. A line is drawn through the wrong letter, and the proper one written in the margin. After every mark of correction a line | should be drawn, to prevent its being confounded with any other in the same line. 5. A turned letter. 6. Letter or words to be inserted. 7. A word or letter to be transposed. Where letters only are to be transposed, it is better to strike them out, and write them in their proper sequence in the margin, like a correction. 8. Change to italics. 9. Period, or close of sentence. 10. A space or quadrat sticking up. 11. The manner in which the apostrophe, inverted commas, the star and other references, and superior letters and figures, are marked. 12. Indicates a broken letter. 13. A letter of a wrong fount. 14. Roman type. 15. The space to be removed and the letters closed up. 16. A space wanted. This mark is also used when the spacing is insufficient. 17. Denotes slip of a letter, either up or down, and is to be straightened. 18. No new paragraph; the lines to be run on. 19. Directs a capital letter or word to be made small. 20. A new paragraph. This should be avoided as much as possible, as it causes great trouble and expense. 21. When letters or lines do not stand even. 22. Em-dash; hyphen. 23. Denotes that the lines do not range. 24. Lead to be taken out. 25. Lead to be put in. 26. Bad spacing between the words. 27. A word struck out, and afterwards approved of (Lat. *stet*, let it stand).

Proof Plane. Small conducting disk or sphere attached to an insulating handle, made preferably of shellac. Its use is to convey small quantities of electricity from one place to another. For example, in examining the surface density at different points on a conductor, the proof plane conveys the charges to the torsion balance or electrometer by which they are measured.

Proöstracum. Anterior pen-shaped part of the guard of a Belemnite.

Proötic. Anterior of the two ventral elements of the ear capsule of the vertebrate cranium.

Propaganda. Congregation of 30 Cardinals, in charge, under the Pope, of all missionary jurisdictions among Protestants, Orientals, Mohammedans, and Pagans.

Propagation. Any means by which new individuals are produced by other than sexual processes, such as budding or by spores, fission, etc.

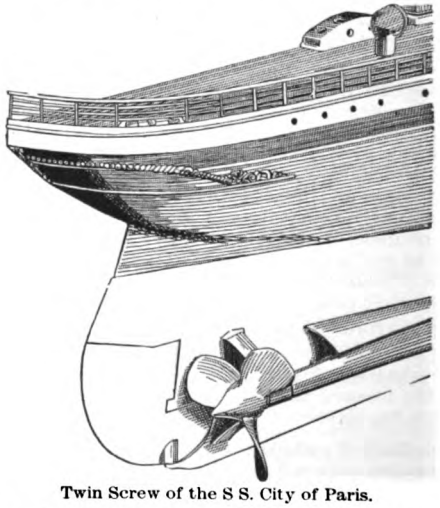
Propagula. Buds or gemmæ of peculiar structure, which, becoming detached from certain plants which produce them (various Algæ, Lycopods, Pondweeds, etc.), grow and propagate the plant; also runners or stolons.

Propane. C_3H_8. Gaseous hydrocarbon of the marsh gas series; present in solution in crude petroleum. It burns readily to carbonic acid and water, and is prepared by treating the propyl iodides with nascent hydrogen.

Propargyl Alcohol. $CH{:}C.CH_2OH$. Propinyl alcohol, bpt. 114° C.; mobile liquid of a pleasant odor, unsaturated.

Propargylic Acid. See PROPIOLIC ACID.

Propeller. Wheel with helical blades or vanes, used in the screw propulsion of vessels. They have two, three, or four blades, and are cast all in one piece, or have the blades bolted to a hub. The latter plan makes it unnecessary to renew a whole wheel when accident has happened to one blade only. Larger ones are of cast iron, smaller ones



Twin Screw of the S S. City of Paris.

often of brass composition, on account of the curious pitting corrosion which occurs capriciously in salt water. There is great variety in designs for the blades. Some have constant pitch from root to tip, others vary it radially or axially, on account of the greater linear velocity of the ends of the outer radii. Some blades are wider at the tip than anywhere else, used especially for tug-boats, others have the edges parallel. Many smaller vessels have twin screws; in some European designs a bow screw is used as well as one at the stern. The best known propeller designs are Griffith, Hirsch, Isherwood, and Ericsson, besides the common or true helical screw. The greater the number of blades, the less the jarring of the vessel from the revolutions of the screw. In the U. S. Navy the custom has been to curve the blades backward, the generatrix of the helicoid retreating in the plane of the axis. This diminishes shocks to the stern-post. The Kunstädter system of screw-propulsion has behind the main screw a small screw whose shaft has its bearings in the rudder and is deflected sidewise as the rudder turns. This smaller screw shaft is driven by the main shaft by a universal joint, and increased maneuvering power results from the capacity for quick turning.

Propertius, SEXTUS, ab.48–ab.14 B.C. Most famous of the Latin writers of elegy. His works, though harsh in style, have high poetic merit. They were tr. in part 1782, and more fully 1870 and 1875.

Property. That which may be owned and may possess a pecuniary value.

Property, RIGHT OF. Legal right of ownership in anything, as distinguished from the mere right of possession or occupancy. It has arisen, historically, from an earlier form of tribal, communal, or family ownership.

Prophases. Stages of KARYOKINESIS (q.v.) preceding the formation of the equatorial plate.

Prophecy. In Scripture, utterance, under the prevailing influence of God, of some truth respecting His attributes or purposes. It included, incidentally, the prediction of future events, which is its popular meaning.

Prophet. One who speaks for a superior, especially those who in Israel spoke for God against popular corruption, regal tyranny, and sacerdotal formalism. The sons of the prophets were young men trained by them, in hope of a special Divine vocation. Only a few prophets have left writings. The greater, Isaiah, Jeremiah, Ezekiel, Daniel, and the minor, Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi, are so called from the comparative length or brevity of their books.

Prophetic Type. See SYNTHETIC TYPE.

Prophloëm. In Plant Anatomy, early formed phloëm cells of fibro-vascular bundles.

Propiolic Acid. CH ⋮ C.COOH. Propargylic acid; liquid, bpt. 144° C. It forms silky crystals below 6° C. It unites easily with bromine and chlorine. Commercial propiolic acid is the NITROPHENYLPROPIOLIC ACID, ORTHO (q.v.).

Propionic Acid. $CH_3.CH_2.COOH$. Liquid acid, bpt. 141° C., with acrid odor; much like acetic acid in its characteristics; usually prepared by the action of water upon ethyl cyanide; formed by the fermentation of acrylic and lactic acids.

Propionic Aldehyde. $CH_3.CH_2.CHO$. Aldehyde corresponding to propionic acid; bpt. 49° C.; liquid with a suffocating odor, prepared from propionic acid.

Propionitrile. See ETHYL CYANIDE.

Propodial. First element of the limb of a vertebrated animal, including the femur of the posterior, and humerus of the anterior extremity.

Propodite. Next to the last segment of the endopodite (walking leg of a lobster, etc.).

Propodium. 1. Anterior portion or lobe of the Gastropod foot. 2. Anterior abdominal segment, fused with the thorax in bees.

Propontis. See MARMORA, SEA OF.

Proportion. Equality of ratios. A : B : : C : D is read, A is to B as C is to D. The same may be written, $\frac{A}{B} = \frac{C}{D}$. The first and third terms of a proportion are antecedents, the second and fourth consequents; the first and fourth are extremes, the second and third means. The product of the extremes always equals that of the means. A proportion may be transformed: by alternation, inversion, composition; by multiplying or dividing by the same number any two terms, one being an extreme, the other a mean; or by raising all the terms to any positive power.

Proportion, CONTINUED. Succession of equal ratios, in which the consequent of each becomes the antecedent in the subsequent ratio.

Proportional Dividers. Double pair of dividers, having a common joint so that the distance between the points of two legs can be made any convenient multiple of that between the points of the other two; used for enlarging or reducing drawings.

Propostscutellum. Postscutellar plate in the prothorax of Insects.

Propylæum. In Classic Architecture, a decorative or symbolical structure forming the entrance to the forecourt of a temple or other inclosure. Originally it was a fortified gateway, and generally had gates more or less important in its later development.

Propyl Alcohol. $CH_3.CH_2.CH_2OH$. Bpt. 97° C. The normal alcohol is a constituent of fusel oil, and is obtained from it by distillation. It is a liquid, with an odor like that of ordinary alcohol. See ISOPROPYL ALCOHOL.

Propyl Compounds. Compounds containing the group C_3H_7 (propyl), conceived to be derived from propane by the removal of a hydrogen atom. Propane Propyl $C_3H_8—H = C_3H_7$.

Propylene. C_3H_6. Gaseous hydrocarbon of the ethylene series. It can be made by the action of sulphuric acid upon propyl alcohol. It is formed by destructive distillation, and is one of the light-giving constituents of illuminating gas.

Propylene Bromide. $C_3H_6Br_2$. Bpt. 141° C. Heavy liquid, formed by the union of propyl bromide with bromine.

Propyl Iodide. C_3H_7I. Bpt. 102° C. Heavy liquid, formed by the action of phosphorous iodide on propyl alcohol; often used in organic chemistry in synthesis.

Propylite. Volcanic rock of the Washoe, Nevada, and Hungary silver mining districts. Also called greenstone trachyte.

Prorogation. Suspension of Parliament at end of a session.

Proscenium. In classic theaters, the stage. In modern theaters, a structure forming the frame of the stage-opening, expanding toward the auditorium and often furnished with tiers of boxes.

Proscolex. First embryonic stage that develops from the egg of the Tapeworm. When it is swallowed by any animal, it burrows into the flesh of its host and becomes encysted as a hydatid, from which the scolex (or scolices) is produced as a head (or heads) of the future tapeworms.

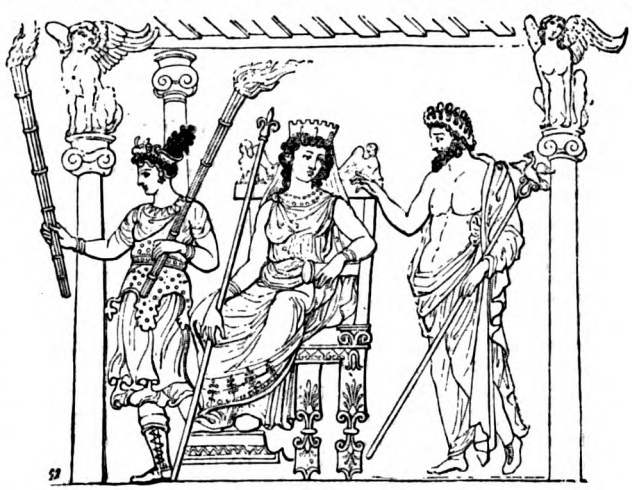
Proscutellum. Scutellar plate of the prothorax in insects.

Prosecutor. One who acts for government in bringing persons to trial on criminal charges, and arraying the evidence against them.

Proselytes. Converts from paganism. Those "of the Covenant" were circumcised; those "of the Gate" accepted the Jewish beliefs but not the entire ritual. See PRECEPTS OF NOAH.

Prosenchyma. Vegetable tissue composed of elongated cells, mostly with lignified walls, variously combined with ducts, forming the wood of plants. It is absent in the *Thallophyta* and *Bryophyta.*

Proserpine, or PERSEPHONE. Daughter of Jupiter and Ceres, wife of Pluto, who carried her off while gathering



Proserpine Enthroned.

flowers, according to the Latin poets; long sought in vain by her mother. The pigeon and cock were sacred to her.

Prosimii (PROSIMIÆ, DAUBENTONOIDEA, LEMURS). This group of animals is usually placed in a separate order of *Placentalia,* but good authorities treat them as a section of Primates, while others put them into the Strepsirhine division of *Quadrumana.* They are connecting links between the Monkeys and the fossil groups *Condylarthra, Mesodonta,* etc., which are generalized ancestors of the Rodents, Carnivores, and Ungulates. See LEMURS and CHEIROMYDÆ.

Prosobranchiata (REPTANTIA, ANISOBRANCHIATA, PECTINOBRANCHIATA, etc.). Diœcious Gastropods, with a shell, and with gills in front of the heart. As a rule only one gill (the left) is present. The sub-orders included are *Placophora, Cyclobranchia, Zeugobranchiata,* and *Ctenobranchiata.* Some authors omit the first two and group the others as *Holochlamyda, Siphonochlamyda,* and *Pneumochlamyda.* See REPTANTIA.

Prosodus. Canal leading water into a sponge ampulla from a general incurrent canal; it abruptly terminates in the ampulla, at which point the endoderm (composed of choanocytes) begins.

Prosody. Science of metrical forms, or of verse in general. The meters of poetry originated in the primitive choral dance, which combined step, melody, and words. This unit was differentiated into the arts of dancing, music, and poetry; but metrical terms like *foot*, *verse* ("a turning"), *arsis*, *thesis*, betray their origin. Classical prosody is based on the principle of quantity, or the relative length of syllables; while modern verse depends chiefly on accent, although quantity plays its part. Repetition (harmony) of a certain arrangement of long and short, of heavy and light syllables is the principle of all prosody. This rhythm, or recurrence, has its natural analogy in the beat of the heart, the ebb and flow of the sea, and can hardly be, as some modern writers claim, a pure invention. Other elements of prosody are tone-color (including rhyme, alliteration, onomatopœia) and the arrangement of verses in a stanza.

Prosoma. Muscular anterior portion of a Nautilus, which usually projects from the shell.

Prosopen (PERSONA). Bion consisting of metameres, or idorgans, as an individual plant, lobster, or fish.

Prosopology. Branch of Biology which treats of the Prosopens.

Prosopygii. Subdivision of Vermes, including the GEPHYREA and the MOLLUSCOIDEA (q.v.).

Prosopyle. Opening from an incurrent canal, or from a prosodus into a sponge ampulla.

Prospecting. Miner's search after ore deposits in a district unknown or little known.

Prosper of Aquitaine, ST., ab.400–460. Latin poet and controversialist, who supported Augustine's doctrine against the semi-Pelagians. He left much theological verse, a *Liber Sententiarum*, and a chronicle to 455. His day is June 25.

Prostate Gland. Glandular substance surrounding the neck of the bladder in the male which frequently enlarges in the aged, rendering micturation difficult.

Prostomium. Lobe or proboscis in front of the mouth of Planarian worms.

Protagon. $C_{160}H_{308}N_6PO_{35}$. Fatty compound forming the chief constituent of nervous tissue.

Protagoras, ab.485–411 B. C. First Greek sophist at Athens, expelled for impiety. His books are lost: Plato wrote against them.

Protamœba. See GYMNOMONERA.

Proteaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 52 genera and ab. 950 species of trees and shrubs, mostly natives of Australia and Africa, with a few in S. America.

Proteana. Section of *Gymnomyxa*, including most of Haeckel's *Monera;* class *Proteomyxa*.

Protection. Legislative restriction of importation by duties, or granting bounties on production, to encourage the industries of the nation.

Protector. Title of a few English regents, as Somerset 1547–48, and Cromwell 1653–58.

Proteida. See PERENNIBRANCHIATA.

Proteids. Those albuminous constituents of protoplasm and its products, which when used as food by animals can be again converted into protoplasm. Examples are: albumen, globulin, myosin, casein, vitellin and peptones. Proteid food is absolutely necessary to sustain animal life and for tissue increase. Other nitrogenous foods, though chemically like proteids, are incapable of forming tissue, unless eaten with proteids. Such are called Albuminoids; *e.g.*, Gelatin.

Protein. Roughly speaking, those constituents of fodders that contain nitrogen. Upon the relation of these substances to the other constituents depends largely the whole system of compounding rations for stock feeding. They are the most important, most costly, and most often lacking constituents of fodders. Protein is estimated by multiplying the amount of nitrogen in a fodder by 6¼.

Protein Substances. See ALBUMENS and ALBUMINOIDS.

Protenchyma. In Plant Anatomy, all tissues not referable to the fibro-vascular system.

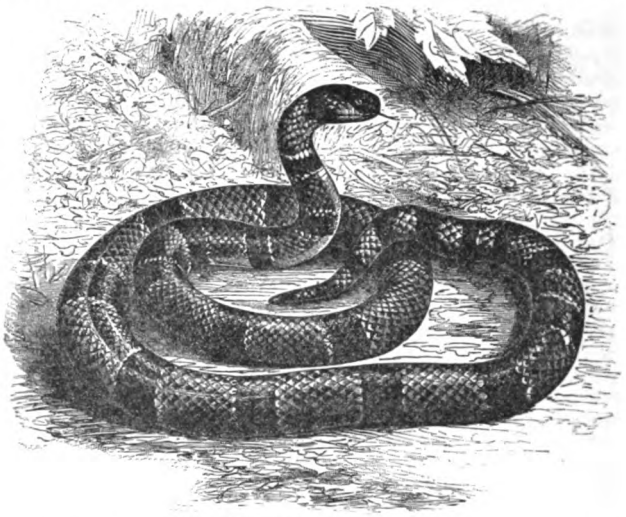
Proteomyxa. See PROTEANA.

Proterandrous. Flowers whose anthers ripen and discharge the pollen before their stigmas are mature, thus preventing self-fertilization; also termed Synacmy.

Proteranthous. Plants whose flowers unfold before the leaves.

Proteroglossa. See PHANEROGLOSSA.

Proteroglypha (ELAPINA). Sub-order of *Ophidia*, including poisonous snakes, having teeth, resembling those of the *Colubriformia*, and in the front of the mouth one or more



Coral Snake (*Elaps corallinus*).

fixed, erect fangs that convey poison from a poison gland. There are two families, the HYDROPHIDÆ and ELAPIDÆ (q.v.).

Proterogynous. Flowers whose stigmas mature before the pollen is discharged from the anthers, thus preventing self-fertilization; also known as Heteracmy.

Proterosauria. Order of extinct Lizards, having biconcave vertebræ and bifid spinous processes. It includes the oldest Lizards.

Proterospongia. See CHOANOFLAGELLATA.

Protesilaus. First Greek killed at Troy. See LAODAMIA.

Protest. 1. Formal objection to a demand, as against duties on goods. 2. Formal statement by a notary upon the dishonor of commercial paper.

Protestanten-Verein. Association formed in Germany 1863–65 to further religious liberty and progress; stigmatized by conservatives as rationalistic, and not favored by the authorities.

Protestants. Christians who in the 16th century detached themselves from Rome; so named 1529 at the Diet of Spires; divided into Evangelical or Lutherans, and Reformed or Calvinists. They include Christians not of the R. C. or Greek churches. The number of Protestants in the world is estimated to be in Europe 80,812,000, America 57,294,014, Oceanica 2,724,781, Africa 1,744,080, Asia 662,750; total 143,237,625.

Protestant Union. Formed May 4, 1608, by Frederic IV., elector of the Pfalz; joined by Wurtemburg, and the Margraves of Franconia and Brandenburg, for mutual protection against infringements of the Peace of Augsburg.

Proteus. Legendary prophet, who tended the flocks of Poseidon; he rose from the sea at midday and slept in the shade of the rocks. Whoever would consult him must seize him then, and hold him fast through all the various forms he might assume. If he could not escape, he resumed his proper shape and told the truth.

Proteus. See PERENNIBRANCHIATA.

Protevangelium. 1. Supposed original of the Gospels. 2. Apocryphal gospel ascribed to St. James.

Prothallium. Small green growth resulting from the germination of the spores of ferns, clubmosses and other *Pteridophyta*, and bearing the antherids and archegones, the reproductive organs; it is the sexual or gametophyte stage of these plants.

Prothorax. Anterior of the three segments of an insect's thorax. It bears the front pair of legs.

Protobathybius. See BATHYBIUS.

Protocatechuic Acid. $C_6H_3(OH)_2COOH$. Mpt. 199°C. Dihydroxy-benzoic acid. Colorless plates, easily soluble in water; product obtained by fusing various resins, as gum benzoin, with alkali; made synthetically by heating pyrocatechin with ammonium carbonate.

Protocercal. See DIPHYCERCAL.

Protococcaceæ. Order of *Chlorophyceæ* or green *Algæ*, including minute forms with isolated cells, or these aggregated into irregular colonies, mainly reproduced by zoöspores.

Protococcoideæ. Class of *Protophyta*, including numerous unicellular green forms, by some regarded as the

undeveloped conditions of *Algæ;* also known as *Chlorophyllophyceæ*, and often placed as a series of *Chlorophyceæ* or green *Algæ*.

Protocol. Original draft of any document, as a treaty; minutes of diplomatic proceedings.

Protodont Dentition. Molar teeth of mammals, whose crowns are compressed and fitted for cutting, rudimentary tubercles being developed on the edges of a main tubercle. The loss of these accessory serrations converts the tooth into the haplodont type.

Protogenes, 4th cent. B.C. Greek painter of Caria, active at Rhodes.

Protogenesis. In Biology, propagation by budding.

Protogenic. In Plant Anatomy, intercellular spaces in plants which are formed coincidently with the growth of surrounding tissues.

Protohydra. See ARCHEGASTRULA.

Protonema. First filamentous growth from the germinating spore of the mosses, on which the moss-plant is subsequently developed from a lateral bud.

Protophyta. Sub-kingdom of plants, including the smallest and simplest members of the vegetable kingdom; usually restricted to those whose increase is effected only by vegetative propagation.

Protoplasm (BIOPLASM). Jelly-like substance contained in the cambium cells of plants; so named by von Mohl 1846; identified 1863 with the Dujardin's Sarcode, 1835, of animal tissues. In it inheres the essential characteristics of living things; viz., irritability, contractility, assimilation, reproduction, heredity, variability or adaptability to environment, etc. To manifest these properties of life it requires an environment containing moisture, a temperature between 32° and 110° F., and organic food compounds of considerable complexity, though if chlorophyl be present it can utilize water and carbonic acid by absorbing the energy of light. Protoplasm consists of various highly complex proteids, built up into a complicated mechanism of unknown structure, but of which we have some glimpses in the phenomena of KARYOKINESIS (q.v.).

Protoplast. Plant or animal cell in its simplest form.

Protopodite. Basal or proximal portion of the appendages of a Crustacean. It consists of two joints, a proximal coxopodite and a distal basipodite. The latter bears two branches, endopodite and exopodite.

Protopteri. See DIPNOI.

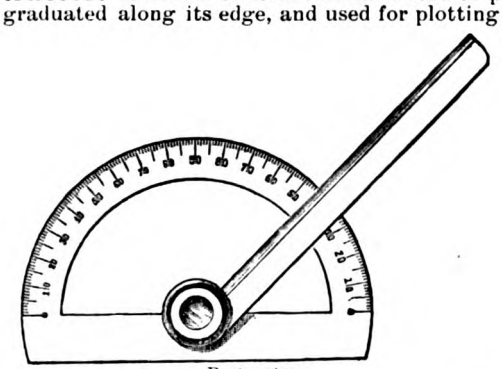
Protopterus. See DIPNEUMONA.

Prototheria (AMASTA, ORNITHODELPHIA, MONOTREMATA). Sub-class of non-placental *Mammalia*, including the single order *Monotremata*. The jaws are toothless in the adult, and sheathed with a beak. Marsupial bones (and pouch) are present. There is a large coracoid. The reproductive organs are bird-like; the testes remain in the body cavity; a cloaca is present, and meroblastic eggs are laid. Two genera are included, ORNITHORHYNCHUS and ECHIDNA (q.v.).

Prototracheata. See ONYCHOPHORA.

Protozoa. First animals, and lowest in scale of organization. They are single cells or colonies of similar cells, and reproduction takes place by cell-division or by spore formation, sometimes preceded by conjugation or by copulation. They are divided into *Rhizopods* and *Infusoria*, or more broadly into *Gymnomyxa* and *Corticata*. The group includes most of the animalcules.

Protractor. Circular or semi-circular sheet of paper or metal, graduated along its edge, and used for plotting angles.



Protractor.

The most precise forms are provided with a vernier and tangent screw, by which minutes as well as degrees may be laid off.

Protriæne. Form of spicule found in the sponge genus *Tethia*. It is a rhabdus with one end forked into three branches.

Proud, JOSEPH, 1745–1826. English Swedenborgian, author of above 300 hymns, of which 164 are used by the New Church.

Proud, ROBERT, 1728–1813. Historian of Pa. 1797–98.

Proud Flesh. Granulations of an inflamed wound. They form part of the process of repair and only when excessive should they be interfered with.

Proudhon, PIERRE JOSEPH, 1809–1865. French socialist, repeatedly fined, imprisoned, or exiled for his publications. *Qu'est-ce que la Propriété?* 1840; *Contradictions Economiques*, 1846; *Confessions d'un Révolutionnaire*, 1849; *La Révolution Sociale*, 1852.

Pro-ungulata. See UNGULATA.

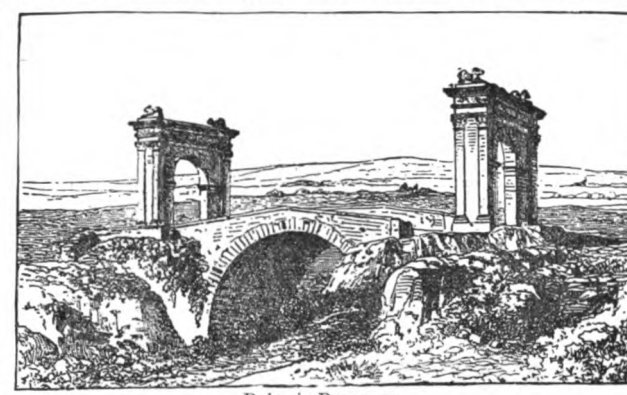
Proust, JOSÈPHE LOUIS, 1755–1826. French chemist; teacher in Spain. *Essai d'une Statique Chimique*, 1803.

Proustite. $3Ag_2S+As_2S_3$. Light red silver ore containing 65.5 per cent silver when pure. It occurs at Freiberg, Mexico, and Idaho.

Prout, FATHER. See MAHONY, F.

Provençal. Romance dialect of s. France, the *langue d'oc* and tongue of the troubadours, flourishing as a literary language chiefly ab.1100–1300.

Provence. Former French province, on the Mediterranean; famous in the Middle Ages; absorbed 1481. It was overrun in



Ruins in Provence.

the 5th century by the Visigoths and Burgundians, and was under the Saracens later. It contains many ruins.

Proventriculus. 1. Masticatory stomach inserted between the crop and the chylific ventricle of certain insects. 2. Dilatation of the œsophagus of birds in front of the gizzard. 3. Similar expansion in front of the stomach in frogs, etc.

Proverbs. Brief, pithy sayings, "sententious and true, long since accepted as such by common consent"; "short sentences drawn from long experience"; "the wisdom of many and the wit of one." They are found among all nations, and have been collected by many hands, as by Erasmus, 1500.

Proverbs, BOOK OF. 20th O. T. book; collection of gnomic utterances as to the conduct of life, prefaced by nine chapters of admonitory poetry, rising in ch. viii. to high religious sublimity; ascribed to Solomon, with appendices by Agur and others.

Providence. Deity, not as first cause, but as present cause interfering to regulate the lot and condition of his creatures in their own behalf.

Providence. Chief city of R. I., at the head of Narragansett Bay; seat of Brown Univ. Its coastwise commerce is extensive, but the principal industry is manufactures, especially of cotton and woolen goods, iron and steel, and jewelry. It was settled 1636 by Roger Williams, and chartered as a city 1832. Pop., 1890, 132,146.

Provincial. Monastic superior, who, besides his own house, has appellate authority over all the houses of his order within a certain district.

Proving-Ground. Establishment for the proving of ordnance before it is finally issued for service. At Sandy Hook, N. J., all the heavy guns, carriages, and rapid-fire guns for service in the U. S. Army are proved, and experimental tests are there made upon trial pieces of ordnance, by ordnance officers under the direction of the Chief of Ordnance.

Provocation, IN ETHICS. Such degree of inducement to a crime as mitigates the offense.

Provoost, SAMUEL, D.D., 1742–1815. Bp. of N. Y. 1787; chaplain of Congress 1785.

Provost. Dignitary at the head of a college, church, or other corporation; in Scotland, chief officer of a town. His rights and duties vary greatly.

Provost-Marshal. Commissioned officer of the army, appointed by the commanding officer to superintend the preservation of order and to act as the chief of police of the camp or army during time of war. He possesses summary power to punish offenders, has charge of the guard and prisoners, and regulates the conduct of camp-followers.

Proxy. Authorization to act for another, as in voting, and he who exercises it.

Proxylem. In Plant Anatomy, first-formed xylem cells in a fibro-vascular bundle.

Prudden, THEOPHILE MITCHELL, M.D., b. 1849. Prof. College of Physicians and Surgeons New York 1892; writer on pathology. *Histology*, 1881; *Bacteria*, 1889; *Dust*, 1891.

Prudence. Intellectual virtue by which we select the right means to a given end, assumed to be the proper object of action.

Prudentius, AURELIUS CLEMENS, 348–ab.413. Spanish Christian poet; lawyer, judge, and ab.394 official at Rome. His hymns (*Cathemerinon* and *Peristephanon*) and other works, mostly doctrinal and controversial, are all in Latin verse, and were produced probably after 405.

Prud'hon, PIERRE PAUL, 1758–1823. French historical and portrait painter. At Rome he met Canova, which influ-

Cupid Caressing before Wounding, by Prud'hon.

enced his style. He forms an interesting figure in French art. His pictures have a grace and tenderness which is wanting in all the pictures of his contemporaries.

Pruinose. Surfaces of fruits or other organs when covered with a bloom.

Prune. Dried fruits of certain varieties of the cultivated plum.

Prunella. Thin woolen or mixed stuff, formerly used for clergymen's gowns, but now employed for covering shoes.

Pruning. Cutting off the branches of trees or shrubs, for the purpose of improving the fruit or timber. Early spring or late winter is the best time for pruning.

Prurigo. Skin disease attended with intense itching (pruritus). Like so many of the terms employed by dermatologists, it is used variously by different authors. At present it is most commonly applied to a chronic, almost incurable, disease beginning early in life and accompanied by an eruption closely resembling the hives (urticaria).

Prussia. Largest and most important state of Germany. It is mainly a plain, being mountainous only in the s. part. Its area is 136,075 sq. m. The culture of rye, the beet root, and the vine, with the raising of cattle, constitute the principal occupation of the rural population. Manufactures are extensively carried on and are varied. The mineral resources are great, and the state has a large internal and external commerce. The government is a limited monarchy, the king of P. being emperor of Germany. The capital is Berlin. The Slavonic tribes that early occupied the Baltic shore were known in the 10th century as Borussi. Bishop Adalbert of Prague suffered martyrdom among them 997. Boleslas of Poland forced them to be baptized 1018, but they rebelled 1161. Their inroads on neighboring states provoked the crusade of the Teutonic knights, who in 1283 became masters of the country; they founded cities, introduced German colonists, laws, and civilization. In 1454 the municipal and noble classes, aided by Poland, rebelled. The knights, by treaty of Thorn 1466, ceded territory to Poland, retaining part in fealty to her. In 1511 the Markgraf, Albert of Anspach and Baireuth, a Hohenzollern, was chosen Grandmaster, and was acknowledged as Duke of P. 1525. Johann Sigismund, elector of Brandenburg, was founder of the Hohenzollern-Brandenburg house 1609.

The territory between the Elbe and Oder, which had belonged from the 12th century to descendants of Albert the Bear, now fell in. The whole country was soon desolated by the Thirty Years' War, but its finances were restored by the Great Elector, Frederic William; and under Frederic II., who added Silesia, its prestige reached a high point. Further additions of territory resulted from the partitions of Poland. Frederic William III., having left his neutral position in the conflict with Napoleon, was defeated 1806, and lost most of his territory. Reorganization of the army, educational and social measures, restored the strength of the nation, which joined the Allies 1813 in their struggle against France. The demand for a constitution, promised 1815, was followed by efforts to check the growth of liberalism. After the revolution of 1848, some conciliatory measures were taken, and plans to promote German unity were welcomed. The Schleswig-Holstein troubles resulted, 1866, in a victorious war of 6 weeks with Austria; the states n. of the Main were partly annexed to P., partly joined with her in the N. German Confederation; Schleswig-Holstein was also annexed. War with France, 1870–71, in which P. was joined by the rest of Germany, ended in the coronation of William I. as emperor of Germany. A struggle with the papal power followed. The guiding spirit in these events was Prince Bismarck. The present period is marked by the growth of Socialism. Pop., 1890, 29,957,367.

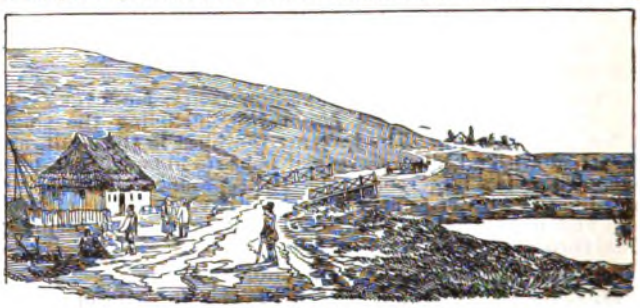
Prussian Blue. Various forms are known. The most common is the blue insoluble powder, $Fe_4(Fe(CN)_6)_3$, FERRIC FERROCYANIDE (q.v.), prepared by mixing ferric solutions with a solution of yellow prussiate of potash. It is used as a pigment.

Prussian Language, OLD. See LETTISH.

Prussic Acid. See HYDROCYANIC ACID.

Prutenic Tables. Astronomical tables, based on the system of Copernicus, and corrected by Brahe.

Pruth. River in s.e. Europe, Austria, Roumania and Russia, rising in Austrian Bukovina, flowing e. and s., forming



Banks of the Pruth.

the frontier between Roumania and Russia and joining the Danube at Reni. Length 380 m.

Prutz, ROBERT EDUARD, 1816–1872. Prof. Halle 1849–51; poet, dramatist, critic, and historian of German journalism and the stage.

Prynne, WILLIAM, 1600–1669. English controversialist, imprisoned 1634–40 for his *Histrio-mastix*, 1633; twice fined and pilloried, and cropped; branded in both cheeks 1627; jailed by Cromwell 1650–52; M.P. 1648 and 1658; keeper of records in the Tower 1660.

Pryor, ROGER ATKINSON, LL.D., b. 1828. M.C. from Va. 1859–60; Brig.-gen. C.S.A. 1863; prominent at New York bar from 1865; Judge of Common Pleas 1891, and of N. Y. Supreme Court 1896.

Prytanis. Greek magisterial title, whose meaning varied in different cities. At Rhodes they were the supreme magistrates, while at Athens the fifty prytanes, for the time being, represented a tribe and presided at the meetings of the council of five hundred. They held office for a tenth of a year, when another tribe assumed the office. These officers in Greek states had certain religious functions, as the care of the sacred fire at the prytaneum, from which the hearth of a new colony must be lighted.

Psalm. Hymn, or sacred song, the prevailing sentiment being of thanksgiving and praise, sung to the accompaniment of a harp or similar stringed instrument and constituting the principal liturgical element in the Hebrew temple service.

David was plainly a composer and regulator of the Temple service as well as a poet. The Psalms were carried over into the Christian service in the form of unisonous antiphonal song, and were among the first of the sacred texts to be utilized by the composers when artistic music entered the church.

Psalmanazar, GEORGE, ab. 1680–1763. Impostor, of unknown origin, whose *Description of Formosa*, 1704, deceived the English for some years. He confessed, amended his ways, wrote other books, and was highly esteemed by Dr. Johnson.

Psalmody. Singing of psalms, either by Jews or Christians; hence the study and translation of them, with all that relates to the accompanying tunes. Versions of psalms, chiefly those of Sternhold and Hopkins, 1549–62, and Tate and Brady, 1696, were almost exclusively used in English worship till after 1700, and formed the chief metrical provision till long after 1800. In Germany and other Protestant lands hymns came into use much earlier.

Psalms. 19th O. T. book (subdivided by the Hebrews into five), containing 150 religious odes, of varying poetic excellence and spiritual depth, ranging in date of composition perhaps from 1000 to 150 B.C.; 73 are doubtfully credited to King David, and 12 to Asaph.

Psalterium. Manyplies, or third pouch of the ruminant stomach. Its walls are deeply folded into longitudinal septa. It receives the food after it has been chewed as cud, and also liquid food directly. It acts as a strainer at the entrance of the fourth stomach, to prevent the passage of coarse particles.

Psaltery. A dulcimer, played with the fingers or a plectrum instead of by hammers. The psaltery was the prototype of the spinet and harpsichord. Notwithstanding the general use of keyed instruments in 1650, it was considered second to none when played with a skilled hand.

Psaltery.

Psammetichus I. King of Egypt 666–612 B.C.; able ruler and extensive builder.

Psammitic. In Geology, having a structure like sandstone, made up of rounded grains of sand. If the grains are sharp, the structure is called gritty.

Pseudamnion. Membrane secreted inward from the pseudo-chorion in *Mustelus*, and tense with amniotic fluid.

Pseudarachna. Division of *Arachnida*, including *Pantopoda* and *Tardigrada*.

Pseudembryo. Larva of an Echinoderm, in which by a new and peculiar developmental process the young of the adult is formed. The process is analogous to the metamorphosis of certain insects.

Pseudepigrapha. Uncanonical writings, falsely attributed to prophets and apostles; akin to the APOCRYPHA (q.v.) of O. T. and N. T., but arbitrarily distinguished from them, less familiarly known, and usually inferior. *The Teaching of the Apostles*, pub. 1883, has historical value.

Pseudhæmal, or PSEUDOHÆMAL. Blood system of Annelids, Echinoderms, etc. It in some cases communicates with the body cavity, and even the external water can in some instances be directly mixed with this false blood. It contains a few corpuscles.

Pseudoadiabatic. Atmospheric changes in which the quantity of contained heat is unchanged, but its effect is changed by reason of the precipitation of condensed vapor.

Pseudobranch. Remnant of a gill in the spiracle, on the mandibular arch of sharks; also a similar remnant on the operculum or hyoid arch in Teleosts.

Pseudobulb. Enlarged basal parts of epiphytic orchids and some other plants.

Pseudo Butyl Alcohol. $CH_3.CH_2.CHOH.CH_3$. Secondary butyl alcohol; liquid boiling at 87° C. See BUTYL ALCOHOL.

Pseudochorion. Membrane derived from the fœtal compartments of the oviduct of *Mustelus*.

Pseudocœl. See ARCHICŒL.

Pseudocumene. $C_6H_3(CH_3)_3$. Bpt. 170° C. Trimethylbenzene. Liquid hydrocarbon, constituent of coal tar, from which it is prepared indirectly.

Pseudocysts. Masses of protoplasm, containing chlorophyll, a number of which compose the minute individual organisms of the classes *Protococcoideæ* and *Cyanophyceæ;* called gonids by some authorities.

Pseudodipteral. In Classic Architecture, denoting that the inner row of columns is omitted and the space from the outer colonnade to the wall of the cella retained.

Pseudofilariæ. Little nematode-like vermiform bodies, produced in pairs at the end of certain Gregarines for purposes of reproduction.

Pseudogaster. Secondary cavity, occurring in sponges by growth, folding, coalescence, or even fusion of different individuals: into it excurrent or even paragastric canals open.

Pseudogastrula. Stage in the development of calcareous sponges, in which the granular cells of the amphiblastula are temporarily invaginated within the flagellated cells. This stage occurs while the embryo is receiving nutriment from the maternal tissues; when the larva is set free, the inner cells are evaginated so as to restore the amphiblastula which precedes true gastrulation.

Pseudoisidorian Decretals. Collection of spurious decrees of the earlier Church, immensely enhancing episcopal and papal authority. It appeared probably ab.850.

Pseudomorphs. Minerals which deviate from the form of crystallization peculiar to that species, either by alteration or substitution.

Pseudonavicellæ. Little spindle-shaped, incased spores resulting from the division of encysted and conjugated Gregarines.

Pseudoneuroptera. Group of *Orthoptera*, including three tribes, *Physopoda*, *Corrodentia*, and *Amphibiotica*.

Pseudonym, NOM DE PLUME, or PEN-NAME. Assumed by an author; often retained through life, and sometimes more familiarly known than the real name, as in the cases of George Sand, George Eliot, Jean Paul, Pierre Loti, Ouida, Mark Twain, Artemus Ward, E. Marlitt, Lewis Carroll.

Pseudoparenchyma. Mycological term for fungus-tissues composed entirely of matted or interlacing hyphæ.

Pseudopodia. The projecting masses of protoplasm from the body of a Protozoan or from the swarm spores of the *Myxomycetes;* also certain stalks supporting the capsule in the Bog-mosses, and certain stalked gemmæ in the genus *Aulacomnion* and other mosses.—In Zoölogy, protrusions which can be produced from the wall or the substance of amœboid cells and retracted at pleasure: the substance of the protrusion again becoming a part of the general protoplasm. Lobose pseudopodia are the locomotor organs of the amœba, hence the name False-feet.

Pseudoprocts. See OSCULUM and PSEUDOSCULA.

Pseudopupa. Stage which intervenes between the larval stage and the pupa in bees and wasps.

Pseudoraphideæ. Order of *Diatomaceæ*, comprising the genera characterized by elongated forms, but an absence of the raphe or median line connecting the nodules.

Pseudoscope. Variety of stereoscope, through which, if one look at a solid object, the concave parts appear convex and the convex parts, concave.

Pseudoscorpionidæ, or CHELIFERIDÆ. Small Arachnids, resembling Scorpions, but without caudal spine and poison gland; the hinder part of the abdomen does not form a narrow, special post-abdomen. They have two or four eyes, two pairs of stigmata, and spinning glands. The book-scorpion is an example.

Book Scorpion (*Chelifer cancroides*).

Pseudoscula (PSEUDOSTOMES). Secondary pores produced in Sponges by proliferation and foldings of the cortical portions. There are two sorts: (1) vestibular, those leading to incurrent canals; to these the word pseudostomes should be restricted; and (2) cloacal, those leading from excurrent canals; these should be called pseudoprocts.

Pseudotetramera. See TETRAMERA.

Pseudotrimera. See TRIMERA.

Pseudovaries. Ovaries as in Aphides. They produce ova capable of development without fertilization. See PARTHENOGENESIS.

Psilomelane. Important ore of manganese, frequently associated with pyrolusite. It is often impure or of less definite chemical composition than the other ores from which manganese is obtained. See MANGANESE ORES.

Psiloteæ. Small and unimportant family of *Lycopodiaceæ*, natives of tropical regions. Three species are known, two in the genus *Psilotum*, one in *Tmesipteris*.

Psittacidæ, or PSITTACI (PSITTACOMORPHA; PARROTS). Group of Scansorial Birds, living in warm climates, especially of America. The beak is stout, the upper mandible is movably joined to the frontal bone, and curved over the short and broad lower beak. The tongue is fleshy, the legs short, strong, and with very short metatarsus. The four toes are

Arara Cockatoo (*Microglossus aterrimus*).

arranged in pairs, so as to be opposable, and can be used like a hand to grasp with. The plumage is usually green. Here belong the PARROTS, MACAWS, and COCKATOOS (q.v.). The last are Australian, and bear an erectile crest of feathers on the head. Most of the Parrots are African; a few are neotropical. The Macaws are wholly neotropical, and are distinguished by their long tails.

Psittacomorphæ. Order of Birds, including the Parrots. See SCANSORES.

Psoriasis. Disease of the skin, chronic in form, and apt to recur, with an eruption, at first of circular patches, afterward spreading and assuming different shapes. These patches are dry and inflamed, and covered with a crust of mother-of-pearl-like scales, a distinction from PITYRIASIS (q.v.). It very frequently attacks the scalp. Arsenic has probably been relied upon more than any other remedy in the treatment of this disease.

Psorosperms. Little spore-like Gregarines, living parasitically in the tissues of Mammals, gills of Fishes, etc. Their full life history is not known.

Psyche. Personification of the soul, loved by Cupid, abused by Venus; finally made immortal and united to Cupid; in art represented as a maiden with the wings of a butterfly.

Psychic Theory of Heredity. This refers the phenomena of development, transmission, sex, phylogenetic variation, etc., to the powers of mind. Protoplasm is conceived to be living and different from other matter; first, because it is a mechanism rather than a substance, and, secondly, is under the control of spirit forces. Hence it is educable and capable of developing into brain tissue, and exhibiting powers of memory, sensibility, volition, and other powers distinguished strictly as psychic. See ARCHÆSTHETISM, PANÆSTHETISM, and LAMARCKIANISM.

Psychology. Science of mind. Leaving out of account the nature of mind, which becomes a problem of metaphysics, it concerns itself solely with mental processes. The contents of the mind, as sensations, thoughts, feelings, impulses, judgments, and their processes, make up its subject matter. But these processes are facts of inner experience, and just here lies one of the greatest difficulties and dangers for the science, for in any mental investigation the court of last resort must be one's own observation of one's own states of consciousness, or introspection, an act notoriously difficult; and to make the difficulty still greater, these states are altered by the very fact of observation. It has been the aim of modern psychology to obviate this difficulty, so far as may be, by obtaining conditions and relations to which methods of greater exactness might be applied. From the beginning of philosophic thought among the Greeks, psychology was inextricably interwoven with metaphysics and epistemology, and it is only within comparatively recent times that it has attained an independent footing as a subject of investigation. This separation from general philosophy and the application of scientific methods have been the chief characteristics of modern psychological progress. Regarded as a science, it is still in the early stages. Its followers are busy with analysis and accurate description, and attempts at synthesis, more or less successful as they may be, are never final. Having achieved independence, psychology has proceeded to subdivide itself. A glance at these subordinate fields will give perhaps the clearest idea of the scope of the general subject. If we may disregard introspective psychology, the foremost of these minor divisions, at least from the number and zeal of its workers, is Experimental Psychology. This is an attempt to apply purely scientific methods to mental phenomena, and the underlying idea is usually Measurement. This quantitative estimate is arrived at by experimental treatment of the body and observation of consequent changes of consciousness, the assumption being made that every mental change has its accompanying nervous change. By obtaining thus a quantitative expression of the nervous series, it is argued that it may be possible in the light of this to determine the relations of the corresponding mental series. Numerous laboratories for the prosecution of such experiments have been founded in different countries, notably in Germany and the U. S., and many experimental psychologists are at work. (See PSYCHOMETRY, PSYCHO-PHYSICS, and FECHNER'S LAW.) Physiological Psychology is the study of the physiology of the nervous system in so far as it bears upon the facts of consciousness. The relation between mind and brain is the highest expression of its subject matter, and as usually conceived it includes such topics as hypnotism, etc., the nature of which is not well enough understood to allow their reference to any distinct division of psychology. Abnormal Psychology deals with abnormal states of mind in their relation to the normal, and much light has been thrown upon mental processes by the study of insanity, idiocy, hysteria, and the various mental affections of pathological nervous states. Comparative Psychology includes two great divisions; first, the comparative study of man in different levels of civilization and development, sometimes called Folk Psychology and depending upon the results of anthropology and ethnology for its material; second, the manifestations of consciousness of the lower animals, a side of the science of particular value and suggestiveness. Child Psychology is an extension of this comparative and genetic study to a field where we can inspect the human mind in its simplest expressions. Practical applications of the knowledge won by all this modern activity are already being seen in various fields, notably in education, as a result of child study, and in the treatment of the insane and the defective and delinquent classes generally.

Psychometry. Science which deals with the measurement of the duration of mental acts; often spoken of in psychology as the measurement of reaction times. *E.g.*, if an observer be required at a given signal, say of sound, to press a telegraphic key, and the moment at which the signal is given be recorded, as well as the moment at which the key is pressed, the difference between the two records will represent the simple reaction time of the observer for an auditory stimulus. This time does not represent a purely mental process. It is made up of the time taken for the stimulus to pass from the external ear to the brain center, the time of perception, and the act of will leading to the proper motor response, and the time of transmission of the motor impulse from the brain to the responding finger. The rate of transmission of sensory and motor impulses being approximately known, by subtracting those two elements from the whole reaction time we obtain the duration of the purely mental processes of perception and volition. The separation of these two elements is more difficult. The same principles are applied to the measurement of association times. See PERSONAL EQUATION and PERSONAL EQUATION MACHINE.

Psychophysics. That side of experimental psychology which deals with the measurement of the intensity of sensation. The problem is to obtain a formula of the relation existing between the intensity of the external stimulus and that of the resulting sensation, for the different senses. Such a formula, which within certain limits holds good for most of the senses, has been found in Weber's Law, which is, roughly, that in order that the intensities of sensations may increase in an arithmetical series, the stimuli must increase in a geometrical

series. The true interpretation of Weber's Law, or its mathematical expansion, known as FECHNER'S LAW (q.v.), is a matter of dispute. There are practically three theories in the field: (1) that held by Fechner himself, that it is a formula of ultimate relation between mind and body; (2) that it is purely psychological in character; and (3) that it is purely physiological. The two latter theories have adherents; Fechner's interpretation is now practically abandoned.

Psychrometer. Instrument for determining the amount of moisture in the air. It is sometimes called the wet and dry bulb hygrometer, and was devised by Mason, although on the Continent it is known as AUGUST'S PSYCHROMETER (q.v.).

Ptah. Probably the oldest of the Egyptian deities. The father of the gods. He was regarded as the creator of the world.

Ptenoglossa. Division of *Ctenobranchiata*, including forms having the lip of aperture of the shell entire, siphons absent, and the radula armed with transverse rows of numerous small hooks, but with no median teeth. *Janthina* and *Solarium* are examples.

Pteranodon. Genus of flying Saurians, with jaws toothless and tail short and slender; comprising gigantic forms from the Cretaceous of N. America.

Pteraspis. Primitive type of small Cephalaspidian Upper Silurian fishes(?), having a bony snout, and the head and the fore part of the body covered with bony plates.

Pterichthys. Placoganoid with arm-like fins; first discovered by Hugh Miller in the Old Red Sandstone of Scotland. See PLACODERMS.

Pteridium. See SAMARA.

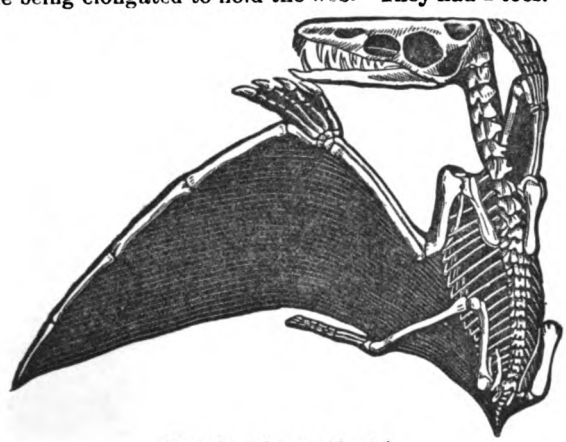
Pteridology. Study of Ferns.

Pteridophyta. Sub-kingdom of plants, also known as Acrogens and Vascular Cryptogams. It includes the ferns and their allies, lycopods or club-mosses, *Equisetæ* or horsetails, *Rhizocarpeæ* and *Selaginellaceæ*, having their greatest development in tropical regions, and a very great antiquity dating from the Silurian. They were the first land plants.

Pterobranchia. See POLYZOA and ASPIDOPHORA.

Pterocardiac Ossicle. See GASTRIC MILL.

Pterodactyls. Flying reptiles of the Mesozoic period. They resembled bats, but had only 4 fingers, the outermost alone being elongated to hold the web. They had 4 toes. The



Pterodactylus crassirostris.

head was birdlike with a beak, usually toothed. Some were fish eaters, and some large, the allied *Pteranodon* of the American Cretaceous having a spread of wing of 20 ft. They belong to the order *Pterosauria* (*Ornithosauria*).

Pteromys. See SCIUROMORPHA.

Pteropoda. Class of *Mollusca*, including forms not having a sharply defined head, but with two wings or fin-like expansions (epipodia), on the rudimentary foot. The mouth is surrounded by tentacles, or by two tentacles bearing suckers (cephalic cones). Sometimes a shell is present. They are hermaphrodite and pelagic (free swimming). Two orders are included, *Thecosomata* and *Gymnosomata*.

Pteropodidæ. See BATS.

Pterotic. Posterior and most external of the projecting bones in the cranium of a fish. It is an element in the ear capsule.

Pterotracheidæ. Family including slug-like pelagic Mollusks: without a shell, and with a well developed mesopodium, bearing a sucker in the males. See HETEROPODA.

Pterygotus. Gigantic Crustacean, very similar to *Eurypterus*, but with the eyes marginal and bilobate tail; called by the Scotch quarrymen Seraphim, from the wing-like form and feather-like ornament of the thoracic appendage.

Pterylæ. Areas on a bird's body that bear feathers. They are separated by apteria or naked spaces. See PTERYLOSIS.

Pterylography. Science, originated by Nitzsch, treating on PTERYLOSIS (q.v.).

Pterylosis. Distribution of the ptilosis or plumage of a bird in PTERYLÆ (q.v.). In Penguins and struthious birds there are no apterial spaces, but in more highly developed birds there are definite pterylæ, with considerable variety. Apteria are generally present along the middle of the back, and especially along the belly.

Ptolemaic System OF THE UNIVERSE. The earth was supposed to be the central body, the sun, moon, and stars revolving about it once per day. Special devices were imagined for representing the motions of the planets and moon, so that their places could be predicted with such accuracy as was demanded at that time.

Ptolemaic System of the Universe.

Ptolemy. Thirteen kings of Egypt of this name, who reigned from 323 to 30 B.C. The founder of the dynasty was Soter, who had been a general of Alexander the Great, and became gov. of Egypt at his death. In 306 he assumed royal power, and in 301, after the battle of Ipsus, added Syria and Cyprus to his dominion.—II. PHILADELPHUS, 284–246, built canals, roads, and the lighthouse on Pharos, and fostered schools and literature.—III. EUERGETES, 246–221, restored the gods Cambyses had carried off, made conquests in Arabia and toward India, and favored scholars at home. The line became extinct in Cleopatra VII.

Ptolemy (CLAUDIUS PTOLEMÆUS), 2d cent. Egyptian mathematician, astronomer, and geographer. His great work on astronomy, commonly known as the *Almagest*, and his treatise on geography were the great authorities on those subjects for 1,400 years.

Ptolemy's Law. If a ray of light or other form of wave motion pass from a point A to a point B in the same medium, but reflected in its course by a plane surface, there is no path from A to B by way of any point of the surface so short as that actually traversed by the ray under the law of reflection; viz., that the angle of reflection equals the angle of incidence.

Ptomains. Substances produced in the process of decomposition of nitrogenous bodies; sometimes called putrefactive alkaloids. They are more or less directly the product of the action of bacteria, each ptomain being generated by its specific bacterium. Many of them are quite poisonous and give rise to the sickness occasioned by eating meats, cheese, ice cream, etc., after the putrefactive changes have begun.

Ptosis. Drooping of the upper eyelid, usually due to a paralysis of the muscle that lifts the lid.

Ptychodont Dentition. Mammalian molar teeth with the sides folded longitudinally, the folds often crossing the crown, as in the Rabbit.

Ptyxis. Folding or coiling of leaves in the bud.

Puberty. Time at which the procreative power develops; in European girls ab. 12 to 14, in boys later; somewhat earlier in the tropics; attended with dangers to health, especially with girls.

Puberulent. Diminutive of pubescent.

Pubescent. In Botany, organs covered with soft, simple hairs.

Publicans. Roman knights who farmed the public taxes: in the Gospels, their subordinates, odious to their Jewish countrymen alike as extortioners and as agents of foreign tyrants.

Public Debts. See APPENDIX.

Public Houses. See HOTEL.

Public Lands of U. S. The western boundary of U. S. was originally the Mississippi River and the southern the 31st parallel of latitude. There have been added.

1808	Louisiana purchase . . .	1,171,931 sq. m.
1821	Florida purchase	59,268 " "
1845	Texas annexed	375,239 " "
1848	Mexican cession	545,783 " "
1853	Gadsden purchase	45,535 " "
1867	Alaska purchase	577,390 " "
		2,775,146 sq. m.

All these increased the government's land holdings except Texas. The total public lands, including those above, was 2,836,757 sq.m.; the total area of U. S. is 3,595,600 sq. m. Exclusive of Alaska, and military and Indian reservations, there remain vacant and subject to entry 600,040,671 acres, June 3, 1895. About 900,000,000 acres have been disposed of. See HOMESTEAD and PRE-EMPTION.

Public Parks. See PARK.

Public Revenue. That of the state, whether it comes from voluntary contributions, from public property, or from taxation.

Public Schools. See SCHOOLS, COMMON SCHOOLS, and COMPULSORY EDUCATION.

Public Wrongs, IN ETHICS. Injuries to others, accompanied with such degree of violence, disorder, or bad example that the state must take cognizance of the action as a crime.

Publilius, or PUBLIUS SYRUS, 1st cent. B.C. Syrian slave in Rome, who wrote and acted Mimes or farces. A collection of his Maxims, *Sententiæ*, survives.

Puccinotti, FRANCESCO, 1794–1872. Prof. of Medicine at Maceraba and Pisa; professional writer of high rank. *Storia della Medicina*, 3 vols.

Puccoon. See GROMWELL.

Puccoon, YELLOW. See ORANGE-ROOT.

Puck, or ROBIN GOODFELLOW. Fairy, prominent in English legends, and in *Midsummer Night's Dream*.

Pückler-Muskau, HERMANN LUDWIG HEINRICH, PRINCE OF, 1785–1871. Prussian author. *Travels in England*, tr. 1832; *Tutti Frutti*, 5 vols., tr. 1834; *Egypt*, tr. 1848.

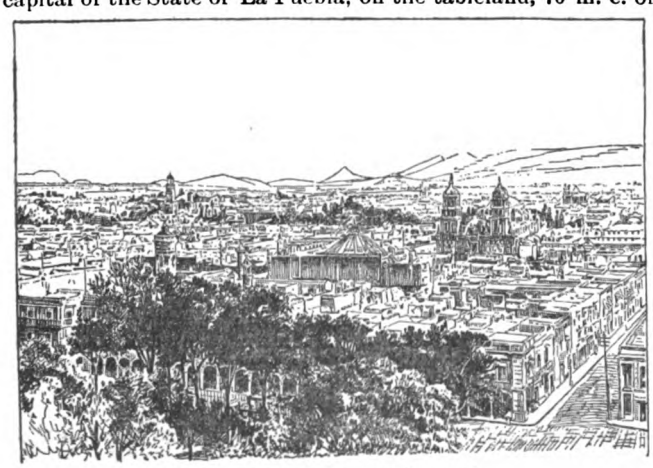
Pud, or POOD. Russian weight of forty pounds.

Pudding Stone. Conglomerate, containing rounded, waterworn pebbles easily distinguishable in the mass of the rock.

Puddle Wall. Made by compacting wet clay in a ditch; often used in reservoir embankments to prevent leakage.

Puddling. Process of converting cast into wrought iron by boiling and stirring in connection with the decarbonizing action of the atmosphere. Invented and patented by Henry Cort 1784. See IRON, METALLURGY OF, and FURNACES.

Puebla, or PUEBLA DE LOS ANGELES. City of Mexico, capital of the State of La Puebla, on the tableland, 76 m. e. of



Puebla.—View taken from the south.

the city of Mexico, and 7,215 ft. above sea; settled 1531; occupied by Americans 1847; taken by the French 1863. It has a good trade and some manufactures. Pop. ab. 100,000.

Pueblo. Capital of P. co., Col.; on the Arkansas, 118 m. s. of Denver; important for its manufactures of iron and steel. Pop., 1890, 24,558.

Pueblo Indians. On the Upper Rio Grande and adjacent tributaries of the Colorado in s. Utah, n. Arizona, and w. Mexico. See MOQUIS and ZUNI. They are probably not closely related either to the Aztecs or the Moundbuilders. The Moquis belong to the Shoshone group of tribes. The houses are large communistic structures, made of adobe and stone, and built around an inner court toward which the roofs are terraced, corresponding to the stories. Ladders are used instead of stairs. Each room is occupied by a family, and some houses accommodate 3,000 people. Ab. 30 villages are now occupied. See CLIFF-DWELLERS.

Puerperal Fever. Acute, febrile affection, probably due to septic infection following childbirth. It varies in severity in different cases, although always a disease with a high mortality rate. The history of some outbreaks affords strong presumption of its contagiousness.

Puerperal Insanity. Mental alienation occurring after childbirth, usually within 5 or 10 days after the birth of the child. Statistics by different observers vary, but it may be safely stated that many more recover health and reason than die during the attack of mania, when it assumes that form, or than fail to secure their reason.

Puerto Principe. City in the interior of Cuba. Pop. ab. 28,000.

Puerto Rico. See PORTO RICO.

Puff Ball. Fungi of the natural order *Gasteromycetes*, especially of the genus *Lycoperdon*, of wide geographical distribution.

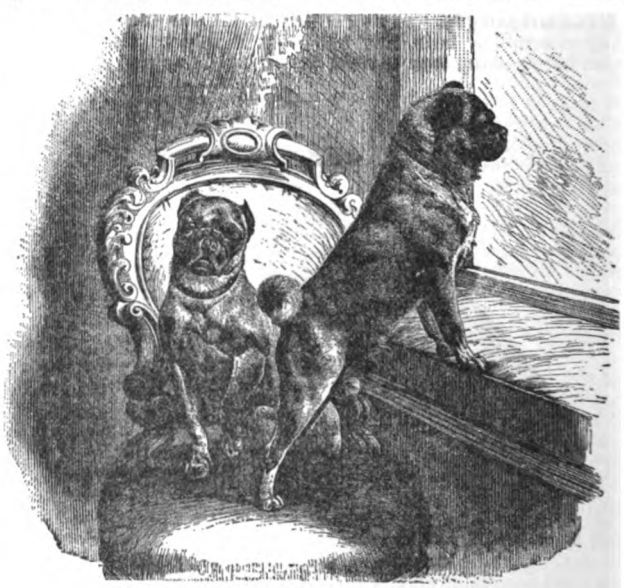
Puffendorf, or **Pufendorf,** SAMUEL, BARON VON, 1632–1694. Prof. Heidelberg 1661, and Lund 1670; Swedish historiographer 1677–88. *Elementa Jurisprudentiæ Universalis*, 1659. His *De Statu Reipublicæ Germanicæ*, 1667, attacked the Holy Roman Empire, and caused much discussion. His *De Jure Naturæ et Gentium*, 1672, is still valued, not so his history of Sweden.

Puffers. See PLECTOGNATHI.

Puffin. See ALCIDÆ.

Pugatcheff, YEMELYAN, 1720–1775. Cossack impostor, who personated Peter III. 1773.

Pug-Dog. Variety of the Bull-dog, with a gentle disposition. Its muzzle is very short, the forehead inflated, and eyes large. The Japanese pug has been so changed by domestica-



Pug-Dog (*Canis familiaris molossus fricator*).

tion, breeding, and a vegetable diet as to present a peculiar dentition. Sometimes only 16 teeth are present, thus: $I\frac{0}{3}\,C\frac{1}{1}\,P\frac{1}{2}\,M\frac{2}{1}$. The hair is long and not curly, sense of smell rudimentary, and size that of a small black and tan terrier.

Puget, PIERRE, 1622–1694. French builder, painter, and decorator.

Puget Sound. Arm of the Pacific Ocean, extending into Washington. It affords excellent harbors.

Pugh, GEORGE ELLIS, 1822–1876. U. S. Senator from Ohio 1855–61; defender of C. L. Vallandigham 1863.

Pugh, JAMES LAWRENCE, b. 1820. M.C. from Ala. 1859–61; U. S. Senator from 1879.

Pugilism. Fighting with the fists has been recognized with more or less respect from the early ages. The classical cestus which with its wicked metal additions gave fatality to the blow of the boxer of old has given place to the modern boxing glove, and the bare-knuckle fights which came in between

the two are now abandoned. The reason for this, however, is not on the score of humanity, but the fighter finds that his hands need the protection of the glove. The pugilistic encounters that have engrossed attention in the days of modern contests have been the Heenan-Sayers international fight 1860, Sullivan-Ryan 1882, Sullivan-Mitchell 1888, Sullivan-Kilrain 1889, Corbett-Sullivan 1892, Corbett-Mitchell 1894, and Fitzsimmons-Corbett 1897. The Heenan-Sayers and Sullivan-Mitchell fights were draws; in the others the first named combatant was the winner.

Pugin, AUGUSTUS, 1762–1832. French-English architect, writer on old buildings in England and Normandy.—His son, AUGUSTUS WELBY, 1812–1852, wrought on similar lines, with much regard for the Gothic. *Principles of Christian Architecture*, 1841.—His son, EDWARD WELBY, 1834–1875, built many R.C. churches.

Pug-Mill. Mill for grinding and mixing clay for bricks and pottery. It consists of an upright iron cylinder with steel knives projecting toward the center; in this a shaft, carrying similar knives, revolves. The clay is worked to a plastic state with water by the action and flows from an opening at the bottom. See BRICK MANUFACTURE.

Pulaski, CASIMIR, COUNT, 1748–1779. Leader of Polish insurgents, outlawed 1772; in the American service from 1777; active in Pa., N. J., and the South; killed before Savannah. —His father, JOSEPH, 1705–1769, organized the Confederation of Bar 1768, and died, with two other sons, in the struggle for national freedom.

Pulaski, FORT. On an islet in Savannah River; blockaded by Union forces Feb. 22, 1861, and taken April 11.

Pulci, LUIGI, 1432–1484. Italian poet and satirist. *Il Morgante Maggiori*, 1481–83.—His brothers, BERNARDO and LUCA, produced less notable verse.

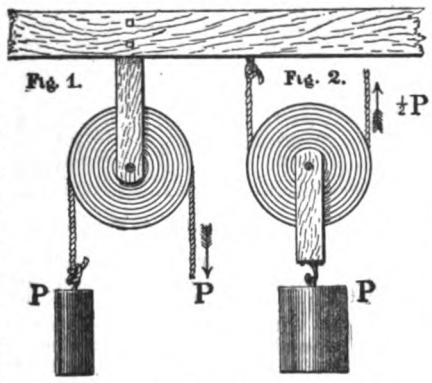
Pulex (PULICIDÆ). See APHANIPTERA.

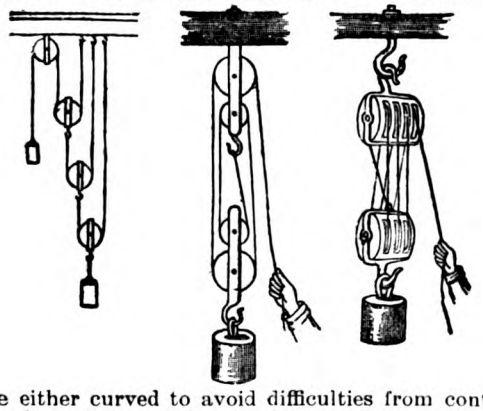
Pulgar, FERNANDO DEL, d. 1486. Spanish biographer and letter-writer.

Pulitzer, JOSEPH, b. 1847 in Hungary. Owner and ed. St. Louis *Post-Dispatch* 1878, and New York *World* since 1883.

Pulkowa. Village near St. Petersburg, 10 m. s. of a famous observatory, erected 1838–39. Its huge telescope dates from 1882. See OBSERVATORY.

Pulley. Flat or grooved wheel or drum, used for transmitting power by a flat or round belt. The simplest use of a pulley is merely to change the direction of application of a force applied to a cord, in which case the pulley is fixed as in Fig. 1. Fig. 2 represents a movable pulley, in which the mechanical advantage is 2; *i.e.*, the weight of P is supported by a tension of only ½P on the cord. Evidently the tension ½P on each side of the pulley just balances the weight of P down; but if P were to be raised, twice as much rope will have to be taken in as in Fig. 1, for the product FS or the work done must be the same. When made of cast iron, the rim is thin, and the





arms are either curved to avoid difficulties from contraction in the cooling of the castings, or if straight must be tapered with special regard to this matter. The section of the arms should be fusiform to cleave the air as they revolve. There are five or more of such arms. There should be metal enough in the hub to enable the pulley to be secured to the shaft by set-screws or keys. Wooden rim pulleys on an iron hub center give lightness and less centrifugal force at high speeds; pressed paper has also been recently introduced for the same uses. Pulleys are called riggers by many English writers. The term pulley is often used in text-books for that form of ELEMENTARY MACHINE (q.v.) in which the lever appears as a wheel to be used with a rope or chain. The wheel or sheave in the block may be called the pulley, but at best the machine should be called a pulley-block.

Pullman Cars. First built 1863; introduced in England 1874; invented by George Mortimer Pullman, b. 1831, who made sleeping-cars 1859, and founded the town of Pullman, Ill., 1880. Standard car is 68 ft. 5 in. long over all, 10 ft. wide, weight 100,000 to 110,000 lbs., with 24 double berths, in all 48 berths, and costs from $15,000 to $20,000.

Pullulating. Phenomena of budding exhibited by the cells of the yeast-plant.

Pulmogastropoda. See PULMONATA.

Pulmograda. See SCYPHOMEDUSÆ and HYDROMEDUSÆ.

Pulmonary Consumption. See PHTHISIS.

Pulmonata (PULMONIFERA, PULMOGASTROPODA). Order of *Gastropoda*, including air-breathing and fresh water snails. The respiratory organ lies in front of the heart; otherwise the internal structure resembles that of Opisthobranchs. The shell is usually right-handed and the respiratory, renal, anal, and generative apertures are then on the right side. The shell may be absent or rudimentary. A true operculum is absent. The radula has a great number of toothed plates on it. Pulmonates are hermaphrodite; a few are viviparous. There are two groups, the *Basommatophora* and the *Stylommatophora*. These belong to the Inoperculate division. Certain Prosobranchs (the *Pneumochlamyda*) are sometimes included here and termed the *Operculata*.

Pulmonifera. See PULMONATA.

Pulp. In Ore Dressing, mass of crushed ore held in suspension in water, or carried along in a muddy current.

Pulpit. Small raised platform in a church, generally protected by a railing, upon which the preacher stands. In modern use they are commonly of wood, though in the Middle Ages many were built of stone.

Pulque. Popular beverage of Mexico; fermented juice of the maguey and other species of *Agave*. A liquor, called Tequila, is distilled from this.

Pulse. Unit of impulse. It is equal to the impulse which acting on the mass of one pound will produce the velocity of one foot per second (1 velo). One pulse evidently has the same effect as one poundal acting for one second, hence the pulse might be termed a Poundal-second.

Pulse. Peas, beans, lentils, and other plants of the natural family *Leguminosæ*, which produce edible pods and seeds.

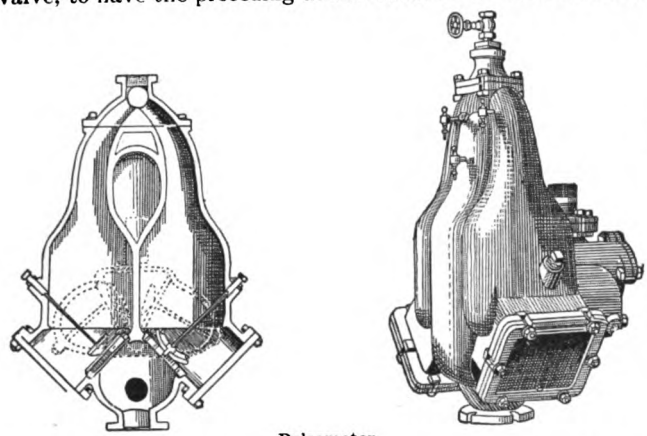
Pulse. Change in shape and size of the arteries due to the wave of blood sent out by the heart's beat. Observation of the character of the pulse enables one to know the rapidity of the heart's action, the strength of its impulse, the volume of blood forced by each beat, and other facts of a similar nature. These are helpful facts in determining the nature of a disease. The artery usually felt is the radial at the wrist. Rapidity of pulse varies with age; at 2 yrs. 100–115 per minute, 7–14 yrs. 80–90, 14–21 yrs. 75–85, 21–60 yrs. 70–75. In sickness it may reach 200 or fall to 20. Exercise increases it. In the horse it is 32–38, cow 35–42, sheep 70–77, dog 90–100.

Pulse Glass. Device of B. Franklin. It consists of a glass tube, bent twice at right angles and terminating in a bulb at each end. The vessel is partly filled with some colored liquid and partly with air. If one of the bulbs be held in the warm hand the air in the upper part expands and drives out all the liquid, and then the air begins to bubble up in the other bulb, quite vigorously if the hand be sufficiently warm. Its motions obviously have no connection with the pulse.

Pulsellum. Flagellum which propels a cell by a sort of screw motion, the cell being pushed in front; *e.g.*, the tail of the spermatozoön; opposite of tractellum.

Pulsometer. Form of pumping engine in which the steam is made to act directly upon the surface of the water to be displaced for the forcing action, and its condensation by the water causes a vacuum in the pump chamber, which is filled through the suction pipe, by atmospheric pressure as usual on the lifting part of the cycle. It is the original Savery engine (see ENGINE, HISTORY OF) in principle. Two pear-shaped cast-iron vessels connect to a common rising column pipe for water and a common suction pipe. Steam enters each chamber alternately as controlled by a ball valve which floats against

the opening into the empty chamber, and presses the contents of the full chamber upward into the delivery. The other chamber meanwhile is filling, and, when full, reverses the ball valve, to have the preceding action occur in it. There are foot



Pulsometer.

valves in the bottom of each chamber, opening and closing by excess of pressure below or above. Such pumps warm the water, and are well adapted for foul and gritty water, as in drainage and wrecking, as there are no moving parts to be abraded.

Pulszky, Francois Aurele, b. 1814. Hungarian author; outlawed 1852–67. *Memoirs*, 4 vols., 1879–82.

Pultaceous. Soft, wet pollen of some species of the orchid genus *Cypripedium*.

Pulteney, William, Earl of Bath, 1682–1764. M.P. 1705; Sec. of War 1714–17; friend of Walpole till 1728, then his dangerous enemy; Privy Councilor and Earl 1742.

Pultowa, or Poltava. Town of s. Russia, 88 m. w. of Kharkov, where Charles XII. of Sweden was totally defeated by Peter the Great June 27, 1709.

Pulu. Soft substance obtained from the stems of certain large ferns, natives of the Sandwich Islands, consisting of their long silky hairs; used to a limited extent for stuffing cushions, beds, etc.

Pulvillus. Terminal joint of an insect's foot (tarsus), as seen beyond and between the ungues, or claws.

Pulvinus. Organ formed by the thickening of the petiole of a leaf at its point of insertion in the blade or on the stem, which has for its function the movements which leaves thus provided exhibit; *e.g.*, the Sensitive Plants and Sleeping Movements.

Puma (Felis concolor). American Lion, Cougar, Panther, or Catamount. Arboreal cat, reddish brown or gray,

Puma (*Felis concolor*).

attaining a length of 5 ft. It inhabits subtropical and temperate latitudes of both Americas. It can conquer a grizzly bear; feeds on pigs, deer, and other herbivores, and is especially fond of peccaries.

Pumice. Vesicular lava, similar to obsidian in composition. It owes its structure to a rapid solidification while still in motion, and to the imprisoning of bubbles of gas in a manner analogous to the formation of froth or scum.

Pumice Foot. In Farriery, a form of laminitis, wherein the sole of the animal's foot becomes convex instead of concave, the horn spongy within and brittle outside.

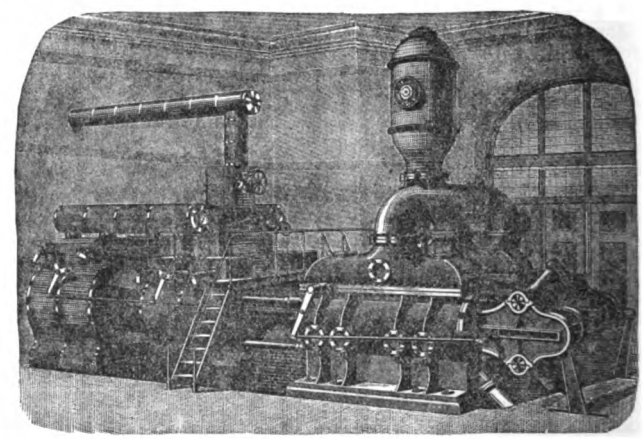
Pump, Cornish. See Cornish Engine.

Pumpelly, Raphael, b. 1837. American geologist, employed in the exploration of Yezo 1861, and of the coal fields of China 1864; in the survey of the copper regions and Missouri 1870–73; member of U. S. Geological Survey from 1879.

Pumpernickel. Rye bread made of unbolted flour; much used in Westphalia.

Pumping. Oscillation of the mercury in the tube of the barometer that results from sudden movements of the instrument; especially troublesome when the barometer is on a vessel at sea, and apt to damage the instrument.

Pumping Engine. Usually of such size and continuous use as to merit a more distinctive name than pump. For city water-works or for mines it is usually either condensing or compound, and either of the fly-wheel type, of the direct acting duplex, or of the Cornish type. In a very few places it is driven by water power, utilizing turbines as motors. The fly-wheel condensing engines are of the river-boat type, with beam and poppet valves: the beam compound have the steam cylinders on the same end of the beam, or on opposite ends. The pump cylinders are vertical in the great majority of cases, and in a very few only are the steam cylinders horizontal, acting on a bell-crank beam. There are few fly-wheel designs



High Duty Pumping Engine.

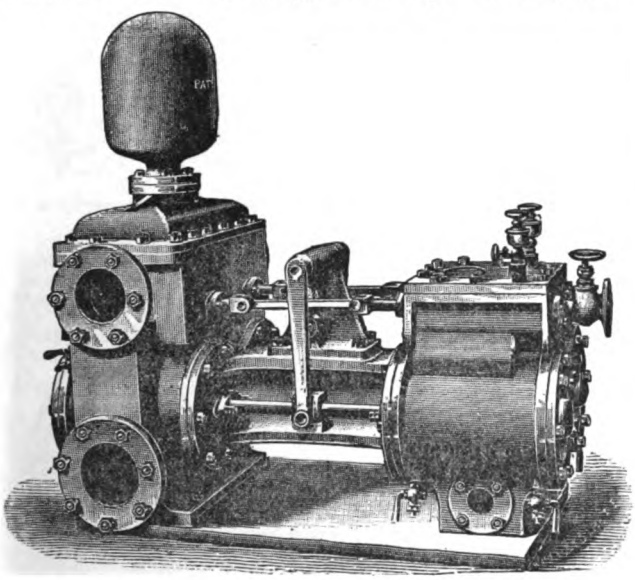
with horizontal water cylinders, although these few are doing excellent work. There are not many geared engines, the pump pistons reciprocating less often than the steam piston. A Corliss engine with cylinders for steam and water arranged radially all around a central vertical shaft which carries the crank disk and pin to which all the connecting rods converge is a type of pumping engine not amenable to the above classification (see Cornish Engine). Pumping engines are usually rated by their Duty (q.v.). For direct acting pumps of ordinary performance, the duty is from 65 to 80 million foot-pounds; with compensators and other improvements this rises to 100 or 110 million. For compound fly-wheel engines of best design 122½ million has been obtained.

Pumpkin. *Cucurbita maxima.* Trailing vine of the natural family *Cucurbitaceæ*, native of America; widely cultivated for its large edible fruit, used in pies; almost always raised as a catch or meslin crop in Indian corn. They furnish a succulent food, useful for milch cows and swine.

Pumps, Belt, or Power. Types of machines for displacing water, in which the power from the motor is transmitted to them by a belt. The simplest of these are simply plunger or piston pumps, in which the rotary motion of the belt pulley is reduced in velocity by cog gear, and the reciprocating motion is produced by a crank. For feed pumps, the stroke of the plunger can be made variable for slow or fast pumping, either by having a slotted link drive a slider which carries the crank-pin, or the equivalent device of having the crank-pin adjustable on a diameter of a wrist-plate by a screw. The Centrifugal Pumps (q.v.) have a rotary disk with vanes, and compel the revolving water to fly outward radially. The

driving axis may be horizontal or vertical. Rotary pumps have one or more revolving radial pistons which fit the flat heads of their casing endwise, and the cylindrical part of it on the outer edge (see ROTARY PUMP). Crank pumps are suitable for relatively small volumes at greater pressures; centrifugal pumps to large volumes at low lifts; rotary pumps to conditions which are a mean between the other two.

Pumps, STEAM. Those in which the pressure and expansive force of steam is applied directly to displace the water, without intervention of transmissive machinery. The primitive type is represented by the PULSOMETER (q.v.): there is also a rotary steam pump, in which each of the two revolving shafts of the pump has on its other end the rotating piston of a ROTARY ENGINE (q.v.): but the more usual type is the piston-pump. This appears in two forms, the fly-wheel and the direct-acting pumps. The fly-wheel pump is an engine with crank, fly-wheel, and a slide-valve driven by an eccentric, the resistance to the engine piston's motion being that due to the water on the pump piston, which is often on the same rod as the steam piston. The fly-wheel makes it possible to work the steam with a degree of expansion, and enables the engine to turn the centers without stopping with the valve over both steam ports in the engine cylinder. Such pumps, however, cannot be worked very slowly, and the regular rotation of the



Steam Pump.

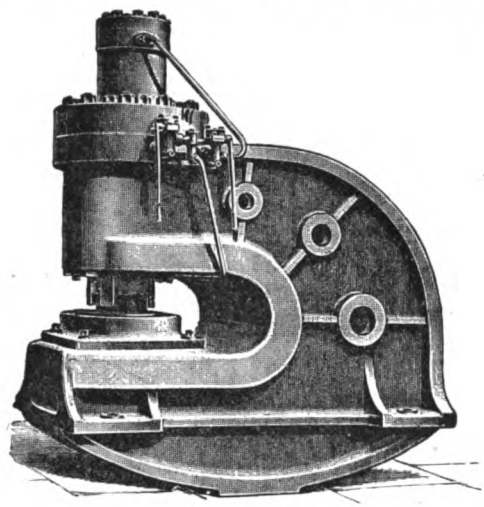
crank compels the water in front of the piston to be accelerated and retarded. The crank-shaft is rotated by the usual connecting rod from a cross-head, or else the crank-pin is made to slide in a yoke on the straight rod. In direct-acting pumps there is no fly-wheel, nor any continuous rotation to move the valve to reverse the steam action in the engine-cylinder. Hence the steam piston or rod must inaugurate some motion before it ceases to move, which shall act while it is at rest at the end of its stroke to reverse its valve. This is universally done by means of an auxiliary piston in a cylinder, the rod from the piston being the valve rod for the main engine. To this auxiliary cylinder the main pumping piston admits steam, either by moving a valve or in some other way causing unbalanced pressure on the proper sides of the auxiliary piston. When this auxiliary cylinder is made also to be a pumping or primary cylinder, the duplex pump results. The direct-acting pump can be run as slow as desired, or as fast as the water column will admit; it will start itself when in good order when pressure is turned on without necessity of being reached by hand, having no dead centers. Pumps may be non-condensing, condensing, or compound; may be horizontal or vertical.

Pun. Play upon words of different meaning, though the same or similar in sound; familiar among Hebrews, Greeks, and Romans; formerly more highly esteemed in England than now; probably carried to the furthest extreme by T. Hood.

Punch. Drink made from rum or other liquor, with water, lemon-juice, sugar, and sometimes other materials; native in India, where arrack is the chief element.

Punch. Humorous weekly, started in London 1841, and ever since conducted with unrivaled success; contributed to by many eminent writers and illustrators, including Jerrold, Thackeray, Hood, Doyle, Leech, and eminently Du Maurier.

Punch. Machine for making holes in metal sheets. A bar of steel of the desired size, shape, and hardness is forced to shear its way through the plate, which rests upon a die on an unyielding surface. This die is a steel block with a hole in it enough larger than the punch to allow of the latter entering easily and with clearance, but which upholds the metal at the edges where the punch is forcing its way. The punch cuts either with a flat face, or the face is milled to a helical surface so that the cut is a successive shear all around the periphery of the hole, instead of acting on the whole area at once. Such



Hydraulic Punch.

punches take less power. The punch is forced through either by a crank motion (appearing either as an eccentric or a simple crank with a slider in a yoke), by a lever driven by a cam, or by a toggle-joint, or else by hydraulic pressure. The total power necessary to punch a hole in a plate is found by multiplying the circumference of the hole into its depth, both in inches, and this product by the shearing strength of the metal per sq. inch. It is objected to punching as a method of making holes that the process fatigues the metal, especially steel (see FATIGUE). This is counteracted either by reaming the hole out all round, or in steel by annealing it. See FLOW OF SOLIDS.

Punch and Judy. English puppet show, the origin of which has been the subject of much discussion. Punch has been identified with Pilate, Judy with the Jews and with Judas, the play being referred to an old mystery. A similar character to Punch exists in the puppet dramas of Italy, Egypt, Syria, Turkey, Persia, Hindustan, Siam, Ava, Cochin China, China, and Japan. He is probably an importation into England from Italy, and his name an abbreviation of the Neapolitan Policinella.

Punctarieæ. Family of brown *Algæ* inhabiting the sea.

Punctate. Leaves or other organs when dotted with minute, translucent areas.

Punctuation. Ab. 350 B.C. it became customary to separate words by points. The modern system was largely the invention of Aldus Manutius, d. 1515, and his son Paulus. Caxton marked the divisions of discourse by oblique lines.

Pundit. Oriental, usually a Brahman, versed in the Sanskrit literature and in the philosophy, laws, and religion of the Hindus.

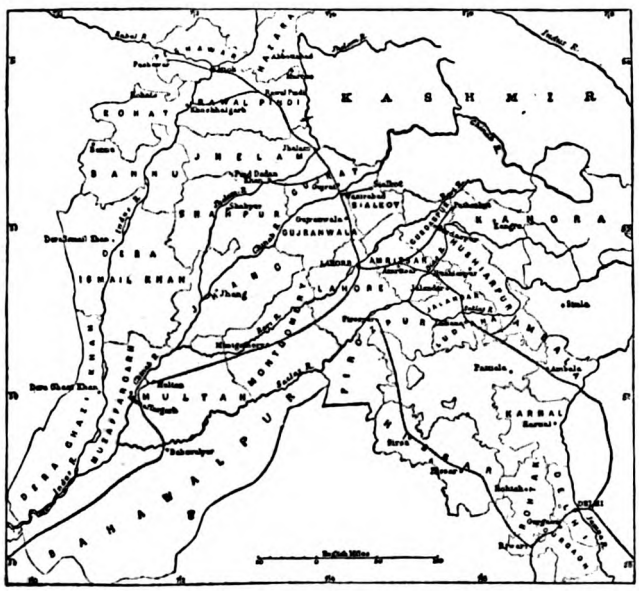
Punic Wars. Between Rome and Carthage. The first, 265–242 B.C., resulted in the loss of Sicily by Carthage. The second began with the siege of Saguntum 218, and ended with the humiliation of Carthage at Zama 201. The third ended in the storming and destruction of Carthage 146, after a three years' siege.

Punishment. That which is inflicted upon an offender because of his breach of the law. The tendency of modern legislation has been to lessen the number of capital crimes, to inflict punishment in private, and to treat the criminal with greater humanity.

Punishment, FUTURE. Commonly held to be eternal; supposed by some to issue in extinction, by others in possible or certain restoration and participation in eternal life.

Punishments, MILITARY. The punishments to which an officer or soldier of the U. S. Army are liable are embodied in the Articles of War. Some of these are explicit for particular crimes and others are imposed at the discretion of a court-martial. In the latter cases, in times of peace, they shall not be in excess of a limit which the President of the U. S. may prescribe; at present these limits are set forth in the Manual for Courts-Martial published by authority of the Secretary of War.

Punjab. Province in n.w. India, watered by the Indus and its five great branches; conquered by the British from the



Map of Punjab.

Sikhs 1845–49. Capital, Lahore. Area 106,632 sq. m; pop., 1891, 20,803,000, besides 4,256,670 in the dependent states.

Punkah. Large ventilating fan, swung from the ceiling, used chiefly in India.

Punshon, WILLIAM MORLEY, LL.D., b. 1824. Pres. English Wesleyan Conference 1874. *Life Thoughts*, 1863.

Punt. Flat-bottomed boat, much used in English inland waters for fishing and shooting.

Punt. Uncertain region on the shores of the Red Sea, anciently in commercial relations with Egypt.

Pupa, OF CIRRIPEDS. Stage in the development of certain Barnacles, intervening between the free Nauplius stage and the fixed adult, in which the larva resembles certain Ostracodes; hence called the Cypris stage.

Pupa, OF INSECTS. Stage in insect metamorphosis in which the larva becomes quiescent and usually protected by a case or a cocoon, and during which the parts of the adult insect or imago (which often differs much from the larva) are formed. If the last larval skin surrounds the pupa, it is coarctate. If the wings, legs, etc., of the adult, are free in the pupa, as in *Coleoptera*, it is a pupa libera; but if cemented close against the pupa skin, as in *Lepidoptera*, it is a pupa obtecta.

Pupienus Maximus, MARCUS CLODIUS, 164–238. Roman emperor with Balbinus 238.

Pupipara. Sub-order of *Diptera* or Flies, whose members are parasitic, like lice, on Mammals and Birds. They are stout, have the thoracic segments fused, and the abdomen broad and flat. The antennæ are short; the proboscis is formed from the labrum and maxillæ. The wings are rudimentary. They are viviparous, and the young are mature when born.

Puracé. Volcano of s.w. Colombia. Height 15,420 ft.

Puranas. Class of old Sanskrit poems, probably composed for the enlightenment of the lower castes. They are theological, and include 800,000 lines in three groups of six each.

Purcell, HENRY, ab.1658–1695. Greatest English musical composer; organist of Westminster Abbey from 1680. He wrote many odes and anthems, and operas. *King Arthur*, 1691.

Purchas, SAMUEL, 1577–1626. English author and compiler. His *Pilgrimage*, 1613–26, and *Pilgrims*, 4 vols., 1625, drew from many sources, and aimed to give "a history of the world, in sea voyages and land travels."

Purdue University. At La Fayette, Ind.; a land-grant college, founded 1862; named from John Purdue, who gave it $150,000 and 100 acres of land. Instruction is given in the various applied sciences and agriculture by 30 professors and 12 assistants to 500 graduate and collegiate students; total number, 635.

Pure Mathematics. See MATHEMATICS.

Pure Tone. Sound in which there are no overtones present. It is emitted by a vibrating body, the motion of which is represented by a simple sine curve. The nearest approach to a pure tone in practice is that emitted by a tuning-fork when carefully bowed across its ends.

Purgatives. See CATHARTICS.

Purgatory. In R.C. theology, a penal state, for the purification through suffering of imperfect heirs of salvation, by the infliction of such measure of the temporal punishment of their forgiven sins as is still owing, except so far as this may be diminished by the Church's intercession, especially in the sacrifice of the Mass. The doctrine of the Greeks is similar, but less defined.

Puri. Town of the Bay of Bengal, India. It is one of the most sacred towns, which for 2,000 years has been the holy land of the Hindus. It is a great resort for pilgrims, being the

Garden Seat at Jagganath, Puri.

seat of the shrine of Juggernaut, and at the time of the festival ab. 100,000 persons assemble. Cholera invariably breaks out, and many pilgrims die upon the journey. Pop. 28,800.

Purification of B. V. M. Feast occurring Feb. 2 in R. C., Eastern, and Anglican Churches; introduced at Rome 494.

Purifications. By the Mosaic Law, contact with a dead body, and various physical infirmities and functions, involved a ceremonial defilement, extended by the touch of the unclean person, and to be removed (the cause ceasing) by bathing and washing the clothes. See MEATS, LAW OF.

Purim. Jewish festival, 14 or 15 of Adar (Feb.–March), in commemoration of the abortive casting of lots by Haman for the destruction of the Jews.

Puritans. English Protestants who desired a purer church discipline, more thorough instruction, and a less prelatical polity. They gradually became in great measure Presbyterians, then Congregationalists and Baptists.

Purity. Control of the appetites and desires, the lower parts of man's nature, by moral sentiments and reason, the higher parts.

Purkinje's Figures. Outlines of the blood-vessels of the retina of the eye made visible to the eye itself. They are obtained by throwing a bright ray of light sidewise through the

cornea upon the retina. The reflected rays from this image cause shadows of the blood-vessels on the retina, which in a darkened room will be projected outward through the nodal point of the eye, and are visible, greatly magnified, upon a favorably placed sheet or wall. The figures are made more distinct by moving the light to and fro. See EYE.

Purl. Mixture of ale, milk, spirits, and sugar.

Purlin. Horizontal beam connecting two main rafters or roof trusses, and serving to support the roof covering.

Purple, TYRIAN. See TYRIAN PURPLE.

Purple Emperor (APATURA IRIS). One of the richest colored and largest butterflies. The expanse of wings is from 2 to 3¼ in., are strong and thick. It frequents the top of oak trees.

Purple Emperor (larva and pupa shown below).

Purple Glow (RED, or ROSY GLOW). Broad colored disk from 5° to 50° above the horizon, over the sun, lasting a few minutes, and reappearing as the sun sinks.

Purple of Cassius. See GOLD TRICHLORIDE.

Purpura. Several conditions and causes other than violence produce extravasation of blood under the skin or mucous membrane. To these extravasations so produced the general term Purpura is given. When the extravasation is due to an external injury, it is called an Ecchymosis. The treatment tends to correct the condition of the blood by strong diet and tonics, if low and the reverse if the condition is excited.

Purpuric Acid. $C_8H_5N_5O_6$. The free acid is unknown. Its ammonium salt is MUREXIDE (q.v.).

Purpurin. $C_{14}H_8O_5$. Trihydroxy anthraquinone; red coloring matter, present in the madder root, and prepared artificially by the oxidation of alizarine; orange needles; usually sold as an alizarine.

Purree, or INDIAN YELLOW. Coloring matter made in India from the urine of cows fed on mango leaves. A single cow produces ab. 2 oz. a day. Often adulterated with chrome yellow. It consists mainly of the calcium and magnesium salts of euxanthic acid.

Purser. Officer having charge of pay, clothing and provisions on a vessel; in the navy displaced by paymaster.

Pursh, FRIEDRICH FRANGOTT, 1794–1820. Botanist. *Flora Americæ septentrionalis*, 1814.

Purslane. *Portulaca oleracea.* Weed of the natural family *Portulacaceæ*, native of Europe, introduced into N. America; probably the worst weed in gardens in the U. S. The only successful method of combating it is to keep the ground stirred as often as the young plants make their appearance.

Purslane, SEA. Low, fleshy herbs of the genus *Sesuvium*, natural family *Ficoideæ*, natives of the seacoast of the s.e. U. S.

Purslane, WATER. *Isuardia palustris.* Low, smooth aquatic herb of the natural family *Onagraceæ*, native of the n. temperate zone.

Pursuivant. Member of the third or lowest office in the college of heralds.

Purus. River in S. America, flowing across Bolivia and Brazil, emptying into the Amazon ab. 100 m. s.w. of Manaos. Length ab. 1,900 m.

Pus. Fluid formed in the process of suppuration. It is a breaking down of the material binding together the cell elements of a tissue, which liquefies and is mingled with the cells, along with others, usually the escaped white corpuscle of the blood. This condition is brought about by the action of certain forms of micro-organisms.

Pusey, EDWARD BOUVERIE, D.D., D.C.L., 1800–1882. Hebrew Prof. at Oxford from 1828; one of the authors of *Tracts for the Times* (Nos. 18, 40, 67), and a leader in the movement which, to his displeasure, long bore his name; a man of retiring manners, ascetic piety, and deep learning, rather than of original thought. His sermons had great influence. *The Real Presence*, 1855–57; *Minor Prophets*, 1860–77; *Daniel*, 1864; *An Eirenicon*, 1865. See TRACTARIANISM.

Puseyism. See TRACTARIANISM.

Pushkin, ALEXANDER SERGEIVITCH, 1799–1837. Russian national poet, eminent alike for epics and lyrics. *The Gypsies*, 1827; *Eugene Onegin*, 1828, tr. 1881; *Poltava*, 1829; *Boris Godunov*, a tragedy, 1830. Some of his prose tales were tr. 1875, and his poems 1889.

Pustule. Small tumor or pimple containing pus. It is of inflammatory origin and usually has a reddened area surrounding the pustule.

Putamen. Shell of a peach-pit or similar vegetable structure. It is morphologically the endocarp of the fruit rendered dense and crustaceous, and contained in the sarcocarp, or pulpy layer.

Putnam, FREDERICK WARD, b. 1839. Director Peabody Academy of Sciences at Salem, Mass., 1867–76; curator Peabody Museum at Cambridge 1874; Prof. of Archæology and Ethnology at Harvard 1886.

Putnam, GEORGE PALMER, 1814–1872. Grand-nephew of Israel; publisher in New York; author of several books of travel; founder of *Putnam's Mag.*, 1853–56.—His son, GEORGE HAVEN, b. 1844, pub. *Books and their Makers*, 1896, and did much for international copyright.

Putnam, ISRAEL, 1718–1790. General of the Revolution, distinguished for his courage and daring. He won renown at Bunker Hill and held commands in N. Y. 1776–77.—His cousin, RUFUS, served through the Revolution, founded Marietta, O.,

Israel Putnam.

1788, was a Judge of the Supreme Court of Northwest Territory 1789, Brig.-gen. under Wayne 1792, and U. S. Surveyor-gen. 1793–1803.—A nephew, GIDEON, 1764–1812, founded Saratoga Springs.

Putnam, MARY TRAILL SPENCE (LOWELL), b. 1810. Biographer of her father, Charles Lowell. *Tragedy of Errors*, 1862.—Her son, WILLIAM LOWELL, 1840–1861, was killed at Bull's Bluff, Va., and celebrated, with two cousins, by their uncle, J. R. Lowell, in a famous passage of the *Harvard Commemoration Ode.*

Putorius. See MUSTELIDÆ.

Putrefaction. Decomposition of organic matter under the influence of micro-organisms. The complex molecule is broken up by a succession of chemical changes through simpler forms of organic compounds into inorganic substances. Disagreeable odors are generated during the process.

Putrid Fever. See TYPHUS FEVER.

Puts and Calls. See OPTIONS.

Putty. Mixture of whiting and oil, used by glaziers and painters.

Putty-Powder. Binoxide of tin, used to polish stone, glass, etc., and in making enamel.

Putty-Root. See ADAM-AND-EVE.

Putumayo. Left branch of the Amazon, rising in Colombia. Length ab. 950 m.

Purvis de Chavannes, PIERRE, b. 1814. French historical and decorative painter of high rank.

Puysegur, ANTOINE HYACINTHE DE, COMTE DE CHASTENET, 1752–1809. French naval officer, in America 1778–79; Portuguese Vico-admiral 1795–1803. *Côtes de St. Dominique*, 1787.

Puzzles. Variety of ingenious devices, now used as means of diversion, in which the object is usually to unravel or disclose some hidden principle or idea by the aid of mechanical skill. Mechanical puzzles, which are very numerous, may all be referred to a few simple principles. Those now extant are practically represented by the well-known ball and cord, the wire ring puzzle, the Chinese geometrical puzzle, the arrangement of numbered blocks called the Fifteen Puzzle, and the American Pigs in Clover. Mechanical puzzles identical with those of Europe and Asia exist among the aboriginal tribes of N. and S. America. No satisfactory explanation has yet been offered of their origin.

Puzzolano. Volcanic earth found near Pozzuoli in Italy, which hardens when mixed with lime and water, forming a hydraulic cement; sometimes called Roman cement. Other varieties are found along the Rhine, near Andernach.

Pyat, FELIX, 1810–1889. French dramatist, in exile 1849–70 and 1871–80; condemned to death 1873 as a leader of the Commune; Deputy 1888.

Pycnidia. Sacs producing propagative bodies known as pycnospores, developed in certain ascomycetous *Fungi*.

Pycnodonts. Family of Mesozoic fish, having the mouth provided with a dense pavement of thick, round, flat teeth.

Pycnodus. Lepidoganoid fish, with large, round, flat-crowned teeth, covering broad jaws as with a pavement of from three to five rows.

Pycnogonida (PODOSOMATA or PANTOPODA; SEA SPIDERS). Group of Arachnids of small size, with four pairs of slender, long, and many-jointed legs, and, in the male, an accessory pair for carrying eggs. They have a conical proboscis, a rudimentary abdomen, and live among seaweeds. Recent students of this group place it apart from the other Arachnids in a class by itself.

Pycnogonum littorale.

Pycnospores. Propagative bodies of certain *Fungi* and contained in sacs called pycnidia.

Pydna. Town of Macedonia; scene of the defeat of Perseus by the Romans under L. Æmilius Paulus 168 B.C., which ended the war.

Pye, HENRY JAMES, D.C.L., 1745–1813. M.P. 1784; poet-laureate from 1790. *Alfred*, 1801.

Pyemia. Condition of the blood when poisoned by the presence of pus-producing micro-organisms; wherever these micro-organisms lodge, secondary abscesses are apt to form. The disease is very often fatal.

Pygidium. Caudal portion of a Trilobite.—Also, last segment of a Coleopter's abdomen, left uncovered by the wing-cases.

Pygmalion. King of Cyprus; lover of a maiden brought to life by Aphrodite from a statue.

Pygmies. 1. Fabulous race of dwarfs represented by Homer as dwelling on the shores of the ocean and attacked by cranes in the spring. 2. Undersized tribes of Africa, found and described by Du Chaillu, Stanley, and other travelers. Ancient writers located pygmy races beyond the limits of the then known world both northward and southward. Aristotle and Herodotus specifically located them in the heart of Africa; the facts that the undersized Bushmen show evidence of once having been spread over a wide area, and that the presence of a tribe of pygmies in Central Africa has been discovered by modern explorers, go to show that the ancient rumors were well founded. Many small people are found in Central America, with all their faculties, but there does not appear to be a tribe.

Pygobranchia. Group of tubicolous Annelids, characterized by having branchiæ on the posterior segments only, as in *Arenicola*.

Pygobranchia (ANTHOBRANCHIATA). Group of Nudibranchs, including the *Doridæ*. These are slug-like Mollusks, crawling about upon seaweed. The gills form a circle surrounding the anus. There is a false mantle fold, and sometimes accessory gills.

Pygopodes (BREVIPENNATI). Group of schizognathous Natatores, with small wings, useless for flight. There are two groups, *Impennes* and *Urinatores* or Pygopodes proper.

Pygostyle. Plowshare-shaped bone at the end of a bird's caudal vertebral column, representing from four to six coalesced vertebræ. It bears the rectrices or tail feathers.

Pylades. Cousin and friend of Orestes, whom he aided to avenge the murder of Agamemnon.

Pylangium. Conus arteriosus of the amphibian heart. It has a row of valves at each end, and one of the anterior valves extends longitudinally toward the posterior row.

Pyle, HOWARD, b. 1853. American author, chiefly of juvenile books, and illustrator. *Men of Iron*, 1891.

Pylon. Monumental gateway to an Egyptian temple. It is sometimes in the form of a truncated pyramid, but was more typically a combination of two such structures connected. They were usually covered with hieroglyphic decorations. It is often used synonymously with propylon.

Pylon of Ptolemy Euergetes.

Pyloric Appendages (CÆCAL APPENDAGES). Finger-like diverticula of the digestive tract of fishes, situated at the beginning of the small intestine.

Pyloric Cæca. 1. Finger-like processes from the duodenum of various fishes. 2. Large pouches from the stomach, one in each ray, of the star-fish.

Pym, JOHN, 1584–1643. One of the managers of Buckingham's impeachment 1626; recognized leader of Short Parliament 1640, and Long Parliament 1641; manager of the impeachment of Stafford and trial of Laud; presenter of the "Grand Remonstrance"; chief of the five members whose attempted seizure brought on the Civil War; real head of the provisional government after the flight of Charles I. His ability was great, his influence enormous; his death, like that of Hampden, was a heavy loss to the nation.

Pynchon, WILLIAM, 1590–1662. Founder of Agawam or Springfield, Mass., 1636; author of a book condemned as anti-Calvinistic 1650; in England from 1652.—His son, JOHN, 1621–1703, took his place, and was prominent in Mass. affairs.—A descendant, THOMAS RUGGLES, D.D., LL.B., b. 1823, has been prof. of Trinity Coll. since 1854, and was its pres. 1874–83. *Chemical Physics*, 1869.

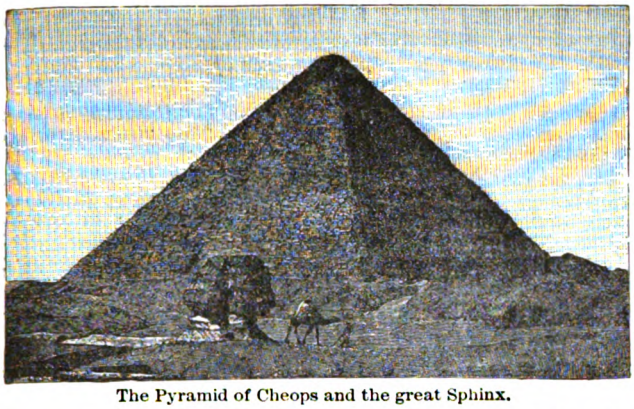
Pyogenic Bacteria. Pus-producing bacteria of wounds.

Pyramid. Polyhedron having a polygon as a base and the other faces triangles meeting at a common point called the vertex; right, when the base is a regular polygon; classified, according to base, as triangular, quadrangular, etc. The altitude of a pyramid is the perpendicular distance from the vertex to the plane of the base. The slant height of a right pyramid is the altitude of any one of its lateral faces.

Pyramid. Variety of the game of marbles, in which the

marbles are placed in a pyramid in the center of a ring; the players shoot at this pile, each taking the ones he knocks out of the circle.

Pyramid, GREAT. Oldest engineering construction, and most expensive one ever built; erected as a tomb for Cheops, king of Egypt, 3733–3666 B.C. It was 481 ft. high, 774 ft. on each side of the base, and contained ab. 89,000,000 cu. ft. of



The Pyramid of Cheops and the great Sphinx.

limestone and granite. Its cost is variously estimated at from 150 to 600 million dollars. It has passages and interior chambers, the chief of which are called the King's Chamber and the Queen's Chamber; the masonry work of these is of the most perfect kind.

Pyramid Lake. In Nevada; drained by Truckee River. Area 205 sq. m.

Pyramids, BATTLES OF. In these Bonaparte defeated the Mamelukes and made himself master of Lower Egypt, July 13 and 21, 1798.

Pyramus and Thisbe. Hero and heroine of a story told in Ovid's *Metamorphoses*, and parodied in *Midsummer Night's Dream*.

Pyrargyrite. $3Ag_2S+Sb_2S_3$. Silver ore dark red in color and very brittle, found in Mexico, Nevada, and Idaho.

Pyrena. In Botany, seed-like endocarps of certain small drupes of several cells which ripen into a berry-like fruit, as in the Huckleberries.

Pyrene. $C_{16}H_{10}$. Hydrocarbon contained in coal tar and obtained from the portion boiling above 360° C.; solid, crystallizing in white plates.

Pyrenees. Range of high mountains traversing from e. to w. the isthmus connecting the Iberian peninsula with the mainland of Europe, and serving as a boundary between France and Spain. It is a comparatively narrow continuous range, having but two passes available for carriage roads. The core

The Cirque of Gavarnie, on the Pau.

is granite, with sedimentary formations down to the Cretaceous flanking its slopes and in many places extending to its summits. Its length is ab. 270 m., with a mean height of 8,000 ft. The highest summit is Pic de Nethou or Maladetta, 11,168 ft. The Cantabrian Mts. are a continuation westward.

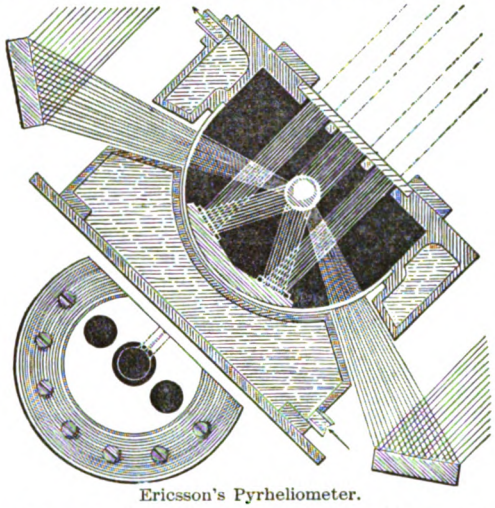
Pyrenees, BATTLES OF. Between the English under Wellington and the French under Soult, July 25–Aug. 1, 1813. The latter was driven into France with loss of more than 20,000 men.

Pyrenocarps, or PERITHECIA. Sporocarps of the *Pyrenomycetes*.

Pyrenoids. Minute, rounded bodies found in the chromatophores of certain *Algæ*.

Pyrenomycetes. Order of *Fungi* belonging to the subclass *Ascomycetes*, having flask-shaped sporocarps open only at the neck. Most of the numerous species are parasites.

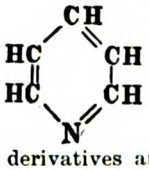
Pyrheliometer. Instrument devised 1876 by Pouillet for measuring the intensity of the sun's radiation. It consists of a shallow circular box of thin copper or silver, blackened and filled with water, in which is immersed the bulb of a thermometer, the stem being partially inclosed in the tube which supports the box. At the lower end of this tube is a disk, equal



Ericsson's Pyrheliometer.

and parallel to the bottom of the cylindrical box. This is for receiving the shadow of the box, and enables the face of the latter to be directed accurately toward the sun. By noting the effect of the sun's rays on the temperature of the water during a given time, a measure of the power of the sun's heat is obtained. Herschel's actinometer was designed for the same purpose and is similar in construction.

Pyridine. C_5H_5N. Bpt. 117° C. Liquid, with a very disagreeable odor, present in bone-oil and obtained from it. It is a strong base. Hydrogen changes it to piperidine. Its constitution is



and from it numerous derivatives are formed by replacing the hydrogen atoms by groups. It is made by treating nicotinic acid with lime.

Pyriform. In Botany and Zoölogy, pear-shaped organs or organisms.

Pyriphlegothon. River of the lower world.

Pyrite. FeS_2. Iron pyrites; a very common mineral, containing sulphur and iron, 53.4 per cent of sulphur, and 46.6 per cent of iron. It occurs in many different forms and diverse conditions. When crystallized the form is usually a cube or a pentagonal dodecahedron. It is a common accessory and harmful ingredient in mineral coal, in slate, and in sandstone. In mineral veins it is abundant as a gangue, and is frequently sufficiently auriferous to be treated as a gold ore. It has no value for the iron it contains, but is largely and increasingly utilized in the manufacture of sulphuric acid. The largest commercial producers of pyrite are Spain, Germany, and Mass. and Va., where it occurs in mass deposits of great extent and often carries enough copper to be of value as a source of that metal: 210,000 tons were imported into U. S 1892.

Pyrites. In the plural, a considerable number of metallic sulphides, allied in some of their properties to pyrite (iron pyrites), though differing widely in others. The most of these sulphides have value for the metal they contain, as copper, nickel, and cobalt.

Pyro Acids. If from two molecules of the ortho acid one molecule of water be abstracted, a pyro acid is formed; *e.g.*, $2H_3PO_4—H_2O=H_4P_2O_7$, pyrophosphoric acid.

Pyrocatechin. $C_6H_4(OH)_2$. Mpt. 104° C., bpt. 245° C.

Orthodihydroxybenzene. White crystals with a phenol odor, present in raw beet sugar, and prepared by the fusion of many resins with potash; commonly made by the decomposition of its methyl ether, GUAIACOL (q.v.).

Pyro-Electricity. Electrification produced by heat. Certain minerals, when heated or cooled, become electrically polarized, or exhibit opposite electric properties in different parts. Tourmaline is a substance of this kind.

Pyrogallol, or PYROGALLIC ACID. $C_6H_3(OH)_3$. White plates, melting at 115° C.; prepared by heating gallic acid and splitting out carbonic acid from it. It has a powerful affinity for oxygen, and is hence used as a reducing agent. It takes oxygen from silver salts, depositing the metal. It is used in photography.

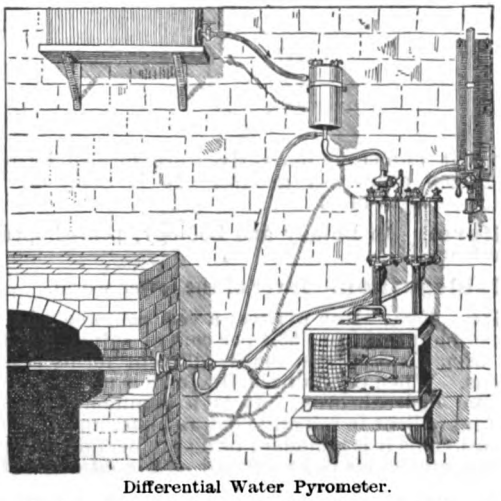
Pyroligneous Acid. Impure ACETIC ACID (q.v.), formed by the destructive distillation of wood.

Pyrolusite. MnO_2. Manganese dioxide; one of the most important ores of manganese; worked extensively in many parts of Europe and of the U. S.

Pyromagnetic Generator. Apparatus devised by Edison for utilizing the change of magnetism in a magnetic metal by heat for the purpose of generating an electric current. The metal to be heated is in the form of a thin sheet rolled up and surrounded by a coil of wire. The thin sheet he called an interstitial armature, since it connects the poles of a powerful electromagnet. When this armature is heated by the passage through it of a current of hot air it loses its magnetism, and when a current of cold air is sent through it, it gains it, this magnetization and demagnetization being used to generate a current in the coil.

Pyromancy. DIVINATION (q.v.) by fire or the forms appearing in fire.

Pyrometer. Apparatus for measuring high temperatures above the limits of ordinary thermometers; used for furnaces, flues, chimneys, and hot blast ducts. There are three types. The first uses two bars of metals which expand unequally by heat, fastened together, and their free end so connected to a needle that the amount of curve given to the compound strip by a given heat shall move the needle through so many graduations. Objection to this type is that prolonged action of heat gives the bars a permanent change in length, which vitiates the readings. The second type depends on the different electrical conductivity of platinum wire at different temperatures. A battery cell and a galvanometer are required, and the cell which produces a given deflection of the needle when the conducting wire is cold deflects the needle a less amount when the wire is heated in the gas or flame to be measured. Heats are determined by fusion of metals or alloys of known character, or by



Differential Water Pyrometer.

other methods, and a table of deflections worked out for the particular instrument in question. The third type uses a ball or lump of some material of known weight and specific heat, which is placed in the material whose temperature is sought, and kept there till it reaches the same heat. It is quickly removed and dropped into a known weight of water, and it is observed by how many degrees the water is warmed. Then, if W = weight of water, w = weight of ball, T = original temperature of water, t = final temperature of water and ball, x = unknown temperature of heated ball, and c = its specific heat, and radiation and evaporation be prevented, we have $W \times 1 \times t - T = w \times c \times (x - t)$, in which x is the only unknown quantity. This is an exact method if a material is used whose specific heat has been determined exactly for the range of temperatures in question. For temperatures within the yielding point of glass, the AIR THERMOMETER (q.v.) can be successfully used as a pyrometer.

Pyrope. Bright red garnet, much used in cheap jewelry; Bohemian garnet.

Pyrophone. Instrument devised by arranging a set of tubes of different lengths, which are made to sound by SINGING FLAMES (q.v.).

Pyrophorous. Said of any substances which take fire from the rapidity with which they oxidize. If tartrate of lead is heated in a tube until the organic matter is charred and then poured into the air, it will take fire.

Pyrophosphates. Derivatives of pyrophosphoric acid.

Pyrophosphoric Acid. $H_4P_2O_7$. Made by heating phosphoric acid to 200°–300° C. The pyrophosphates are formed by heating secondary phosphates.

Pyrosis. Abnormal condition of the stomach where there is a burning sensation accompanied by belchings of an acid or bitter fluid. It is a form of dyspepsia and may be relieved by moderate doses of some alkaline substance (baking soda, magnesia), but the cure depends upon removing the causes leading to the condition. See HEARTBURN.

Pyrosoma. See ASCIDIANS.

Pyrosulphuric Acid. See DISULPHURIC ACID.

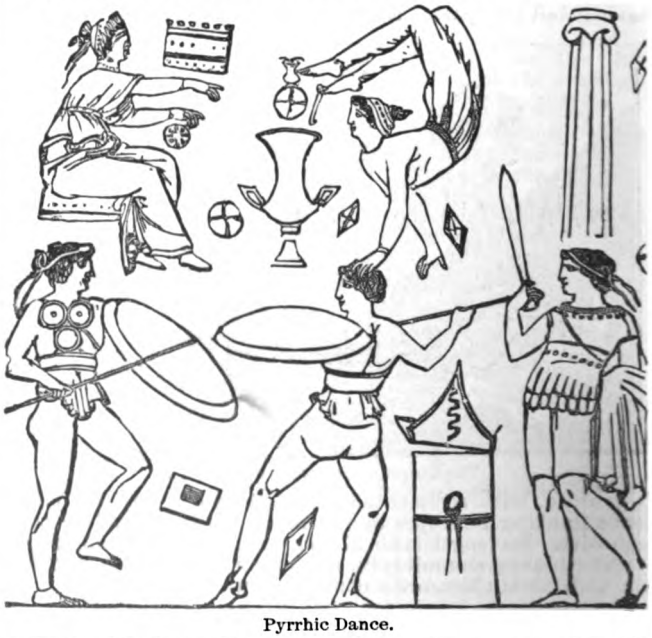
Pyrotechny. Art of preparing combustible compositions which give a pleasing effect when set on fire; of unknown antiquity, practiced by the Chinese from early times. These compositions are solid mixtures of combustible and oxidizing agents, to which some substances to modify the rate of burning and some to give color effects are added. The principal ingredient of pyrotechnic composition is mealed gunpowder, which burns slowly when well tamped, and evolves large volumes of gas. The decorations placed in paper shells, Roman candles and rockets are principally stars, serpents, marrons, gold rain, and rain of fire; these are formed from niter, sulphur, mealed powder, charcoal, metallic filings and the salts of various metals for color effects, such as sodium for yellow, calcium for red, strontium for crimson, barium for green, and copper for green or blue: iron and steel filings give sparks. Formerly the construction of fire-balls, carcasses, rockets, port-fires, slow and quick match, and other military pyrotechnics was a branch of military instruction, but having recently lost much of their importance, due to the introduction of electricity, they are now for the greater part practically obsolete.

Pyroxene. Mineral closely allied to amphibole in almost all respects. The name includes several varieties of aluminous and non-aluminous anhydrous silicates of calcium, magnesium, and iron. Among these varieties the most important are diallage and augite, which are common ingredients in crystalline rocks.

Pyroxylin. Usually, the explosive hexa-nitrate. See NITROCELLULOSE and GUN COTTON.

Pyrrha. Wife of Deucalion, the Noah of Greek legend.

Pyrrhic Dance. Native in Crete; performed by Spartans



Pyrrhic Dance.

and other Greeks in full armor, with warlike movements. The prototype in Crete was the dance instituted by the Curetes to

drown the cries of the infant Zeus. It was a mimic fight, intended to show the art of attack and defense.

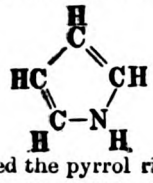
Pyrrho, OF ELIS, ab.360–ab.270 B.C. Greek philosopher of the Skeptical school, who denied all knowledge of the nature of things.

Pyrrhonism. Absolute skepticism, named from Pyrrho, who maintained that we cannot know that we know anything; uncertainty attaches to every proposition the human mind can frame.

Pyrrhotite. Fe_nS_{n+1}. Magnetic pyrites; compound of iron and sulphur, in which the value of n ranges from 5 to 16. It often contains enough nickel to be of value as a nickel-ore.

Pyrrhus, 318–272 B.C. King of Epirus 307, expelled 302, restored 295; in Italy, as ally of Tarentum, warring with Rome 280–278, and in Sicily, with Carthage, 278–276; defeated by Dentatus near Beneventura 275; conqueror of most of Macedonia 274; at war with Sparta 272; killed at Argos by a tile thrown by a woman.

Pyrrol. C_4H_4NH. Basic liquid, bpt. 126° C.; present in coal tar, but usually prepared from bone-oil. It has an odor like that of chloroform. It is thus constituted,



and the ring C_4N is called the pyrrol ring.

Pyruvic Acid. $CH_3.CO.COOH$. Bpt. 165° C. Ketone and acid; liquid, strong acid, produced by heating tartaric and similar organic acids.

Pythagoras, 582–504 B.C. Greek philosopher, founder of the Pythagorean school and of a republic at Crotona, Italy, which treated its citizens as brothers and equals. He applied mathematical conceptions of numbers to metaphysics, was one of the first to maintain the immortality of the soul in the form of metempsychosis, and was ascetic in the theory and practice of morals. He is supposed to have discovered the famous proposition that "the square on the hypotenuse of a right triangle is equivalent to the sum of the squares on the other two sides."

Pythia. See PYTHONESS.

Pythian Games. Festival in honor of Apollo and Artemis, celebrated originally at Delphi once in 8 years, later in a plain near by every 4 years, alternating with the festival at Olympia; so called from 581 B.C., when gymnastic contests were added to the musical; managed by the Amphictyons after 346 B.C. Musical and artistic contests were always the most prominent feature; the prizes were a chaplet of laurel, a symbolic palm-branch, and a statue in the plain where the contests were held. They lasted till 400.

Pythias. See DAMON.

Python. Serpent which sprang from the mud left by the deluge of Deucalion, lived in the caves of Mt. Parnassus, and was slain by Apollo, who founded the Pythian games to commemorate his victory.

Python. See PEROPODA and AGLYPHODONTA.

Pythoness. Priestess of Apollo at Delphi, through whom the oracle gave responses.

Pythonomorpha (SEA SERPENTS). Group of Saurians of the Cretaceous period, represented by fossils from N. J., Ala., Kansas, etc. The body was serpentine in shape, the limbs small, the teeth and jaws adapted for swallowing large prey whole. They lived in the warm seas that covered the e. plains of the Appalachian and Rocky Mt. systems. Members of the genus *Clidastes* ranged from 12 to 40 ft. in length, those of *Mosasaurus* reached a length of 80 ft., and of *Liodon* even more, perhaps 100 ft.

Pyx. 1. In the R.C. Church, name given to the box in which the host is kept. 2. Box in which coins are kept of each successive coinage, these coins to be examined by experts as to their accuracy in weight and fineness. The examination thereof is called the trial of the pyx, and takes place at the Philadelphia mint the second Wednesday of February, annually.

Pyxis (PYXIDIUM). Capsular dry fruit which opens by the top falling away as a lid, the dehiscence being circumscissile, as in the Henbane and Plantain.

Q

Q. S. Abbreviation for quantum sufficit (as much as needed), used in writing medical prescriptions.

Quackenbos, GEORGE PAYN, LL.D., 1826–1881. American author of text-books, as is his son, JOHN DUNCAN, b. 1848, prof. Columbia 1884.

Quackenbush, STEPHEN PLATT, U.S.N., 1823–1890. Lieut. 1855, Lieut.-commander 1862; distinguished on the Atlantic coast in the war; Commodore 1880, Rear-admiral 1885.

Quack Grass. *Agropyron repens.* One of the worst weeds of cultivated grounds. It spreads by seed, but more rapidly by its vigorous underground stems, and is eradicated only by the most vigorous and thorough culture. In grass fields it is not so troublesome, as it is nutritious and cattle are fond of it. It is also known as couch, switch, and quitch grass.

Quadragesima. First Sunday in Lent; name now little used.

Quadrangle. Having four angles. A complete quadrangle is one each of whose sides intersects the other three.—Also an open space or courtyard having four sides and quite or nearly surrounded by buildings. Public buildings, such as castles, colleges, city halls, etc., are usually planned in this way.

Quadrangle of Arundel Castle, England.

Quadrant. Arc of 90°; one-fourth of a circle. In trigonometry the circle of reference is divided by horizontal and vertical diameters into four quadrants: the first is that above the horizontal and to the right of the vertical diameter; the others are numbered to the left, second, third, fourth.

Quadrant. The dimensions of inductance being simply a length, the unit in the C.G.S. system is a centimeter. In practice a unit 1,000,000,000 times as large is chosen and called a quadrant, this being the number of centimeters in a quadrant of the earth.

Quadrant. See OCTANT.

Quadrantal Deviation. Deviation from its normal position produced upon a magnetic needle by horizontal masses of iron or steel magnetized inductively by the earth. The phenomenon occurs on shipboard in the case of the compass needle. In swinging the ship round there are four positions in which the influence would be a maximum, and four in which it would be a minimum: hence the name.

Quadrantal Pendulum. Body moving about an axis according to the same law with reference to a quadrant on each side of its position of equilibrium, as a common pendulum with reference to a half circle on each side.

Quadrantal Triangle. In Spherical Trigonometry, triangle having one side a quadrant. Such triangles are solved by their polar right triangles. If each side be a quadrant, the triangle is called triquadrantal.

Quadrate. Bone to which the lower jaw is articulated in vertebrates below mammals. In the latter this bone has become the incus, or middle bone of the three auditory ossicles, and the jaw articulates directly with the skull.

Quadratic Equation. One involving the second power of the unknown quantity and none higher. A quantic may be quadratic in respect to one variable and not so for another. A complete quadratic has both first and second powers of the unknown.

Quadratic Expression. Product of two binomial factors of the first degree, each containing the variable associated with a constant which with changed sign is one of the roots of the equation formed by equating the quadratic expression with zero.

$$x^2-5x+6=(x-3)(x-2)$$
$$\text{If } x^2-5x+6=0,\ x=3 \text{ or } 2.$$

Quadratic Reciprocity. Law established by Legendre and called by Gauss the gem of arithmetic, connecting any two odd primes.

Quadratojugal. Bone in the upper jaw, between the quadrate and jugal, in Vertebrates below Mammals.

Quadrature. Obtaining the measure of any surface in terms of the unit applied to rectilinear plane surfaces.

Quadrature. Position of the moon when 90° from the sun, and therefore in first and last quarter; also of a planet when 90° from the sun.

Quadratus. Christian apologist 125. A fragment is preserved by Eusebius.

Quadribasic Acids. See ACID.

Quadric. Algebraic expression of the second degree between two or more variables, as

$$ax^2+bxy+y^2+c.$$

Quadrifoliolate. Compound leaves with four leaflets.

Quadriga. Greek or Roman chariot drawn by four horses, as a biga by two. The two center ones were only yoked while

Quadriga.

the two outside ones were attached by ropes. It was the common racing chariot of the circus and in processions.

Quadrigarius, 1st cent. B.C. Historian of Rome from the invasion of the Gauls to Sulla. Of his 23 books only fragments remain.

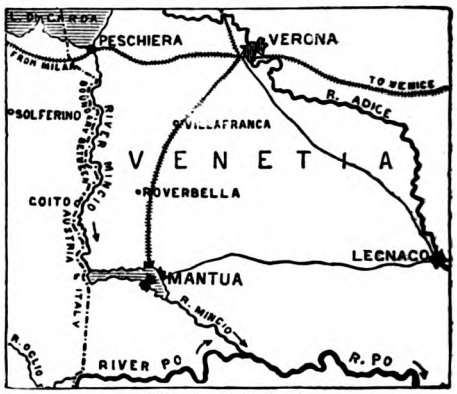
Quadrigemminal Bodies. Optic lobes of the midbrain in the higher Vertebrates; on each side divided by a transverse groove into an anterior natis and posterior testis.

Quadrijugate. Pinnately compound leaves with four pairs of leaflets.

Quadrilatera. See CRABS.

Quadrilateral. Surface bounded by four lines. A complete quadrilateral is one each of whose sides intersect the other three. By placing conditions upon the relations of the sides, specific forms of the quadrilateral are obtained.

Quadrilateral. Four strong fortresses in n. Italy, Verona and Legnago on the Adige, Mantua and Peschiera on the Mincio; surrendered by Austria to the Italians Oct. 16, 1866. The Turkish quadrilateral was Shumla, Varna, Rustchuk, and Silistria; lost by treaty of Berlin July 13, 1878, which secured the



The Quadrilateral.

autonomy of Bulgaria. Novogeorgievsk, Warsaw, Ivangorod and Brest Litovsk constitute another in Russian Poland.

Quadrille. 1. French dance of four or more couples, popular in England since 1808. 2. Card game, resembling l'hombre, which was a three hand game and preceded it; much played ab.1670–1740.

Quadrilocular. Four-celled anthers in the flowers of certain plants.

Quadrivium. See SEVEN LIBERAL ARTS.

Quadroon. Person with one-fourth negro blood.

Quadrumana. See SIMIADÆ.

Quadrupeds. Broadly, all four-footed vertebrated animals; but usually and popularly, mammals that walk on all four feet.

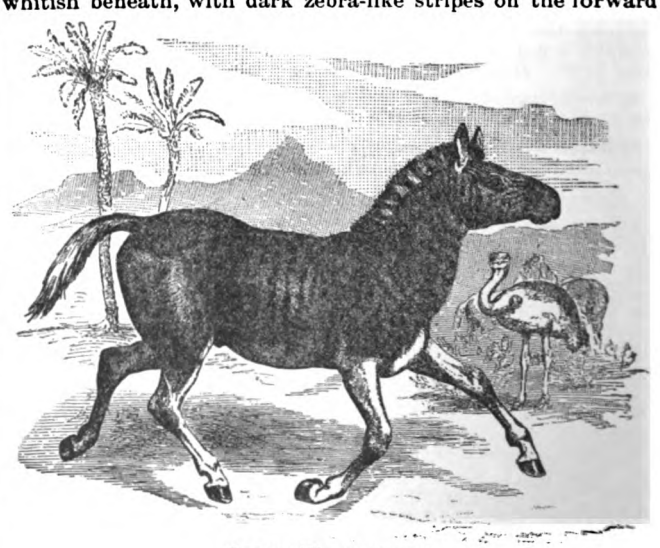
Quadruple Alliance. Between England, France and the German emperor, July 22, 1718; joined by Holland Feb. 8, 1719. It guaranteed the succession to the reigning houses of England and France.

Quadruplex (TELEGRAPHY). System of multiple transmission in telegraphy, by which two messages in each direction may be transmitted over the same wire at the same time. Suggestions of the possibility of such a system were made 1855 by Dr. Stark of Vienna, but the first practical instruments were brought out by Edison in New York in 1874.

Quadruplicate Ratio. Ratio of the fourth powers of quantities.

Quæstor. Roman annual magistrate, who assisted the higher officials. He had the supervision of the treasury, of the streets of the city, and of certain courts. From 421 B.C., military quæstors accompanied the commander to his province and had charge of the finances and commissariat.

Quagga. S. African wild horse, reddish brown above and whitish beneath, with dark zebra-like stripes on the forward



Quagga (*Equus quagga*).

part of the body. Height 4 ft. 6 in. at the withers. Its flesh is esteemed as food by the Bushmen. It occurs in large herds

on the wild plains, but is rare near civilized communities. See ZEBRA.

Quahaug. See ISOMYA.

Quails. Gallinaceous partridge-like birds, including the Old World genera *Coturnix*, *Turnix*, *Perdicula*, etc., and the New World *Colinus* (*Ortyx*), *Lophortyx*, *Oreortyx*, etc. *C. communis*, the European quail, can cross the Mediterranean in its migrations. *C. virginianus*, the quail of e. U. S., or Bob White, known as partridge in the South, resembles grouse but is smaller. Length 9 in. Its head is not crested, the plumage is chestnut red, and greatly barred and streaked. They nest in May. *L. californicus*, of the Pacific coast, has a black crest, blue breast, plumage chestnut, each feather edged with black. *O. pictus*, the Mountain quail of the same region, is also crested, and a large, handsomely marked bird. See PARTRIDGES.

Quain, JONES, 1796–1865. Prof. at London Univ. 1833–61. His *Anatomy*, 1828, was much used.—His brother, RICHARD, F.R.S., 1800–1887, prominent as practitioner and writer, was pres. Royal Coll. of Surgeons 1868. *Anatomy of Arteries*, 1845. —A half-brother, SIR JOHN RICHARD, 1817–1876, became a judge of Queen's Bench 1872.—Their cousin, SIR RICHARD, LL.D., b. 1816, a leading physician and medical writer, was made Baronet 1891.

Quaker Bridge Dam. See DAMS.

Quaker Guns. False guns made of logs and placed in embrasures to deceive the enemy.

Quaker Hill. In R. I.; scene of a battle between British and Americans, Aug. 29, 1778, the latter holding the field.

Quakers. Name given to FRIENDS (q.v.) in derision, and largely though unofficially used.

Quaking Grass. Grasses of the genus *Briza*, mainly natives of the Old World, sparingly introduced as weeds into N. America.

Quality. 1. Property of anything, determining its kind. 2. That characteristic of sound which depends upon the wave-form, or of radiation, which depends on the state of polarization.

Quamash. See CAMASS.

Quantic. General term covering all algebraic functions of two or more variables. The number of variables is indicated by an adjective ending in "ary," binary, ternary, quaternary, "n"-ary, designating quantities having two, three, four, or "n" variables respectively.

Quantin, ALBERT MARIE JÉRÔME, b. 1850. Parisian printer. *Origines de l'Imprimerie*, 1877.

Quantitative Hedonism. That form of judging moral actions by their felicific character, in which it is recognized that all pleasures and pains have definite degrees of desirability or its opposite, in addition to their pleasurable or painful quality. See HEDONISM.

Quantity. In a limited sense, anything capable of measurement, increase, or decrease. In wider mathematical use, anything subject to mathematical processes and investigation.

Quantity. Relative length of a syllable, not to be confounded with its force or accent. It is of grammatical as well as prosodical importance, particularly in Latin.

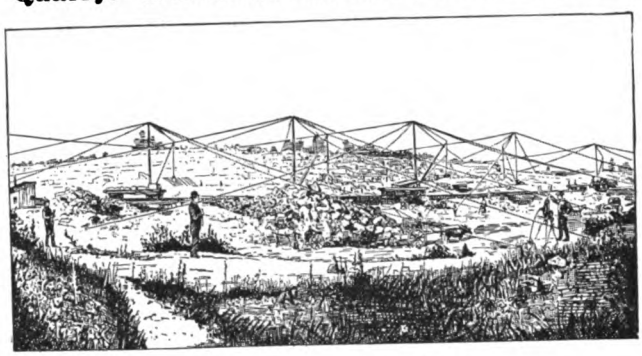
Quantivalence. See VALENCE.

Quaquaversal. Rocks dipping in all directions from a common point.

Quarantine. Methods involving the isolation of the sick having communicable diseases. The word was applied in the Middle Ages to the 40 days' detention of vessels in the Mediterranean ports when they had sailed from countries infected with plague. Out of this has grown the modern system of maritime quarantine, which includes inspection of incoming vessels, isolation of the sick with certain communicable diseases, more especially cholera and yellow fever, detention and observation of the well of the vessels where cases of communicable diseases are found, or are suspected, and disinfection. The word has been applied to inland quarantine, when non-intercourse with a district where communicable diseases are epidemic is enforced; and to domiciliary quarantine, when the inmates of a house are isolated because of the presence of a communicable disease. Regulations against the plague were first established at Venice, then the foremost port on the Mediterranean, ab.1448. A century earlier the household property of such as had died was destroyed to prevent infection. In the U. S. quarantine laws were passed by the colonies, and afterward by the several States. A national act was passed April 29, 1878. The rules now in force were promulgated April 26, 1894.

Quarles, FRANCIS, 1592–1644. English sacred poet. *Feast for Worms*, 1620; *Argalus and Parthenia*, 1622; *Divine Poems*, 1630; *Enchiridion* (prose), 1640. His *Emblems*, 1635, have often been reprinted, sometimes with *School of the Heart* and *Hieroglyphics of the Life of Man*, 1638. He had wit and a gift for epigram: Thoreau said, "He uses language sometimes as grandly as Shakespeare."—His son JOHN, 1624–1665, was a poet.

Quarry. In distinction from a mine, excavation in rock or



Granite Quarries, Monson, Mass.

in ore at the earth's surface; also sometimes underground excavations in non-metalliferous formation, as in gypsum.

Quarry Bed. Stone is said to be laid on its quarry bed when so placed that its strata have the same position as they had in the quarry. This position is conducive to durability.

Quarrying. Stone is quarried by hand tools, by explosives, and by CHANNELING MACHINES (q.v.), the last being extensively used since 1880. By the use of explosives large blocks are detached which are afterward split by hand, but by channeling machines blocks can be cut to dimension size on five of the six sides.

Quart. Fourth part of a gallon, capacity of U. S. 57.75 cu. in., English quart 69.318 cu. in. The ordinary "quart bottle" contains ab. the sixth part of a gallon in U. S.

Quartan Fever. INTERMITTENT FEVER (q.v.), the paroxysms of which occur every fourth day.

Quarter Crack. Separation of the horn fibers in a horse's hoof, caused by bad shoes and bad shoeing. Weakness of the fiber is generally found in hoofs subject to inflammation.

Quarter Days. Four days in the year upon which, by law or custom, moneys payable in quarter-yearly installments are collectable. They differ in different jurisdictions. In N. Y. City, as between landlord and tenant, they are the first days of Feb., May, Aug., and Nov.

Quarter Deck. Uppermost deck of a ship between the main and mizzen masts, when there is a poop; otherwise from the mainmast to the stern. It is the place of honor, and on ships of war this forms the parade.

Quarter Evil. Form of malignant vesicle frequently fatal to the lower order of animals.

Quarterly Review. Founded in London by John Murray 1809; edited by W. Gifford till 1824, and by J. G. Lockhart 1826–53. Scott, Southey, and Croker were among the chief contributors.

Quartermaster. Officer having charge of supplies and transportation in a regiment. For the whole army these are controlled by a quartermaster-general.

Quartermaster's Department, U.S.A. This is under the Quartermaster-general (Brigadier-general), and is charged with the duty of providing means of transportation of every character, either under contract or in kind, which may be needed in the movement of troops and material of war. It furnishes all public animals employed in the service of the army, the forage consumed by them, wagons and all articles necessary for their use, except the equipment of cavalry and artillery. It furnishes clothing, camp and garrison equipage, barracks, store-houses, and other buildings; constructs and repairs roads, railways, bridges; builds and charters ships, boats, docks, and wharfs needed for military purposes, and attends to all matters connected with military operations which are not expressly assigned to some other bureau of the War Department.

Quarter Sessions. Courts of general sessions of the

peace, which are held quarterly. They are mostly for the trial of criminals.

Quarter Staff. Defensive weapon formerly used in England, consisting of a pole ab. 6½ ft. long, which was grasped with both hands, one near the middle and the other between the middle and the end. Dr. Johnson explains its name by this manner of holding. Combats with quarter staves were a common rustic amusement.

Quartet. Composition for four instruments or voices. Quartets for stringed instruments originated with Haydn, and were developed by Mozart and Beethoven. Vocal quartets, up to the time of Wagner, were frequent features in operas.

Quarter-twist Belt. Arrangements of a flat endless belt which transmits power from a pulley on one shaft to another on a shaft at right angles to it and not in the same plane as the first. In the simplest case, with no guide pulleys, the driving pulley must be placed so that the plane through the center of the face passes tangent to the driven pulley at the point where the belt leaves it. The belt in this case drives by an edge only; a wider belt is necessary than for parallel shafts, and the shafts should not be too near, nor should there be too great difference in the diameters of the pulleys. If a guide pulley is introduced, or two, so that the lateral stiffness of the belt is not called upon to help keep the belt in place, more friction is introduced, but the full driving power of the belt can be used. For round or triangular belts with grooved pulleys, no appreciable loss occurs.

Quarter Undulation Plate. Plate of some doubly refracting substance, of such a thickness that, when interposed in the path of a beam of plane polarized light of a particular color, and with its principal section making an angle $\pm 45°$ with the plane of polarization, it converts that beam into circularly polarized light. This result may be brought about in two ways; either a small plate may be of just the right thickness to cause a relative retardation of a quarter wave length in the two rays produced by double refraction, or two thicker plates may be used, so placed that their differential action produces the same retardation.

Quartic. Quantic of the fourth degree; as, $x^4+y^4+4x^3y+6x^2y^2+4x^3y+C$.

Quartine. In Botany, fourth coat in the wall of certain ovules.

Quartley, ARTHUR, 1839–1886. American painter of marine subjects.

Quartz. SiO_2. One of the most abundant minerals in the earth's crust; silica, containing 46⅔ per cent of silicon and 53⅓ per cent of oxygen. It occurs in many forms, colors, and conditions, but is usually recognized with ease by its hardness and its power of resisting the ordinary chemical reagents. When occurring by itself in crystalline masses of great extent, it forms the rock known as quartzite; in rounded grains cemented together, it constitutes sandstone. Associated with other minerals, as feldspar, mica, or amphibole, it is an important constituent of many of the common crystalline rocks. See AMETHYST, CHALCEDONY, CARNELIAN, AGATE, ONYX, FLINT and JASPER.

Quartz Mining. Mining for gold on veins of auriferous quartz, in distinction from the methods employed in the hydraulic process or in working placer deposits.

Quartz Porphyry. Porphyry consisting of feldspar and quartz with large grains of the latter.

Quartz Rock, or QUARTZITE. See QUARTZ.

Quasi Contract. Obligation created by law and not by a true contract. It may be redressed in a contract action.

Quasimodo Sunday. In France and Germany name given to LOW SUNDAY (q.v.).

Quasi-moral Sentiments. Sentiments of repugnance at the performance of actions which we believe to be right and yet have been in the habit of considering as dubious or which would in other circumstances be wrong.

Quasi Rent. Payment received by those who at any time have special advantages or facilities for production, not accessible to all; differing from Rent as usually understood, principally in its more temporary character.

Quasi Taxes. Sources of revenue to the State which are in their nature not exactly the exploitation of public property, nor ordinary taxes collected from individuals, but something between the two, such as the granting of monopolies and lotteries, and fees for public services.

Quassia. *Quassia amara.* Small tree of the natural family *Simarubaceæ*, native of n. S. America; the whole plant is intensely bitter, as are others of the same family. The name Quassia is now transferred to the bitterwood of W. Indies; the *Quassia excelsa*, which contains quassiin, $C_{10}H_{12}O_3$, a bitter principle. The chips have been used in making beer and the decoction of it in medicine and in killing flies.

Quassia (*Quassia amara*).

Quaternary. Division of the Cænozoic age, often called the era of Man, including the Glacial period and all subsequent time. See COLUMN.

Quaternion. In the Roman army, guard of four soldiers, "corporal's guard"; mentioned in Acts xii. 4, in the narrative of St. Peter's imprisonment and deliverance.

Quaternions. System of analysis devised by Sir W. R. Hamilton ab. 1843. It grew out of efforts to interpret the imaginaries of algebra. The elements are: Vectors ≡ V, tensors ≡ T, versors ≡ U, scalars ≡ S, and quaternions. A vector is a symbol of transference in direction or a directed line. The unit vector is the same for all lines having the same direction. That which repeats the unit vector to produce any line is called the tensor, and is a coefficient of the unit vector. A vector operating to turn another at right angles to itself is a versor. A unit vector as an operator turns a perpendicular vector through a quadrant at each operation, and is a quadrantal versor. The $\sqrt{-1}$ is an indeterminate unit vector. Tensor and versor are operators. A quaternion is the quotient of two vectors: it is shown to be the product of a tensor and a versor, and also the sum of two parts, one a scalar and the other a vector at right angles to the plane of the two vectors involved.

Quatre-Bras. Hamlet of Belgium; scene of conflict June 16, 1815, two days before Waterloo, between the French under Ney and the Allies. The Duke of Brunswick was slain: Ney withdrew, having lost over 4,000 men.

Quatrefages, JEAN LOUIS ARMAND DE, 1810–1892. Prof. Paris 1850; naturalist and anthropologist. *Souvenirs*, 1854, tr. 1857; *History of Man*, 1869, tr. 1875; *Les Pygmées*, 1887.

Quatrefoil. In Gothic Architecture, a four-leaved perforation.

Quatremère, ÉTIENNE MARC, 1782–1857. Prof. Rouen 1809, Paris 1819. *Language and Literature of Egypt*, 1808; *The Nabatheans*, 1835. He tr. histories of the *Mongols of Persia*, 1836, and the *Mameluke Sultans*, 1837–40.

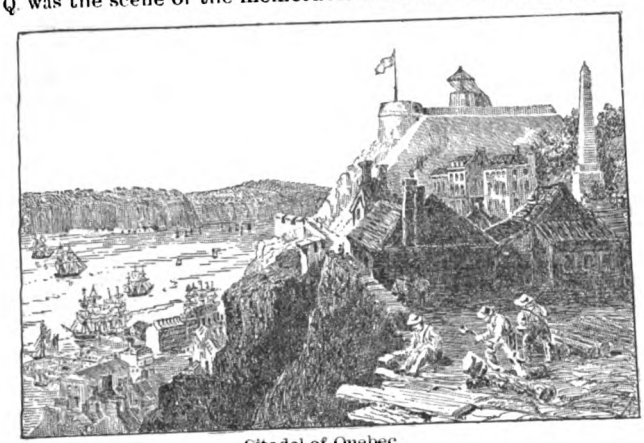
Quatremère de Quincy, ANTOINE CHRYSOSTOME, 1755–1849. Prof. Paris 1818. *Jupiter*, 1814; *Fine Arts*, 1823; *Raphael*, 1824; *Historic Dict. of Architecture*, 2 vols., 1833; *Canova*, 1834; *Michelangelo*, 1835.

Quay, MATTHEW STANLEY, b. 1833. U. S. Senator from Pa. since 1887; chairman Republican National Committee 1888–91; manager of the State machine.

Quebec. Province of Canada. Its area is 228,960 sq. m. The surface is undulating and hilly, consisting of a gentle southward slope from the summit, which divides the waters of the St. Lawrence, the chief river, from those flowing into Hudson's Bay. It has an extensive commerce, fisheries, a large lumber business, furnished by the forests which cover it, and some agriculture. The capital is Q. The province was formerly Lower Canada. It was entered 1534 by Cartier, who took possession for France. The first permanent settlement was at Q. 1608: in 1759 the city was taken by Gen. Wolfe. The entire French possessions were surrendered to England 1760. The provinces of Upper and Lower Canada were formed 1791,

but united 1841, and the seat of government finally established at Ottawa. The various provinces were united 1867 into the Dominion of Canada. Pop., 1891, 1,488,535, of whom some 300,000 speak English; seven-eighths are Roman Catholics.

Quebec. Capital of the province of Q., on the n. bank of the St. Lawrence; naturally a strong place; founded 1608 by Champlain. Its citadel was originally designed by Vauban; but the modern one, built 1823, is after Wellington's plans. Q. was the scene of the memorable conflict between Wolfe and



Citadel of Quebec.

Montcalm 1759, which marked the end of the French rule in N. America. It was unsuccessfully besieged by the Americans under Montgomery 1775, and suffered greatly by fires 1815, 1845 twice, 1866, 1870, 1876, 1881. Pop., 1891, 63,090.

Quebracho. *Aspidosperma quebracho.* Tree of the natural family *Apocynaceæ*, native of S. America, where its bark is used as a febrifuge. It contains the alkaloid Aspidospermine.

Queen Anne's Farthings. Farthings struck for the improvement of the coinage in 1713–14.

Queen Anne Style. See RENAISSANCE.

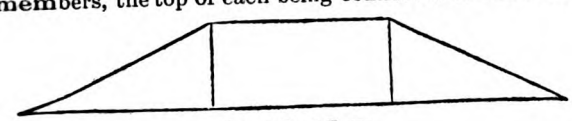
Queen Anne's War. War of the Spanish Succession, 1702–14, so far as it concerned the American colonies. It included the massacre at Deerfield, Mass., 1704, the destruction of several Spanish settlements in Fla. 1704–5, an attack of the French on Charleston 1706, and three attempts by New England troops to capture Acadia, of which the last, 1710, was successful.

Queen Charlotte Islands. In the Pacific, off British Columbia; area ab. 5,000 sq. m. They have some mineral resources, and a small Indian population.

Queen of Heaven. Oriental goddess Astarte, the Moon; sometimes the planet Venus. Her worship was exceedingly licentious.

Queenpost. One of two principals of a trussed roof.

Queen Post Truss. Bridge truss having only two vertical members, the top of each being connected to the abutment



Queen Post Truss.

by an inclined strut; used only for highway bridges of less span than 50 feet.

Queensberry, JOHN SHOLTO DOUGLAS, MARQUIS OF, b. 1844, Marquess 1858. He drew up rules for glove fights which fixed the time of rounds to three minutes, the time between rounds to one minute, and the time allowance for a fallen man to rise to ten seconds. Wrestling and hugging were forbidden.

Queen's College and University. At Kingston, Canada; incorporated 1841. It has 64 instructors, organized in five faculties: Arts, Theology, Medicine, Law, and Practical Science. The last includes the various branches of engineering, with chemistry, biology, architecture and navigation.

Queen's (or KING'S) **Counsel.** Barristers and sergeants appointed by letters patent, and who may not, except by license from the crown, take a brief against the crown; they also renounce written pleadings.

Queen's (or KING'S) **Evidence.** When an accused person turns queen's evidence, he confesses his guilt and offers himself as a witness against his accomplices. Unless his testimony is corroborated, the prisoners are acquitted notwithstanding. See STATE'S EVIDENCE.

Queensland. British colony in n.e. Australia. The surface is mainly made up of semi-arid plains. Nearly parallel to the e. coast is a range of low mountains. Area, 668,224 sq. m.; capital, Brisbane; pop., 1891, 422,776.

Queen's Metal. Alloy, consisting of 75 per cent tin, 8.5 antimony, 8 bismuth, and 8.5 lead, used for table ware.

Queenstown. Irish seaport, in Cork harbor; stopping-place of transatlantic steamers, to land and take on mails. Pop., 1891, 9,123.

Queenstown Heights. In Ontario, Canada. Here ab. 1,000 Americans attacked Oct. 13, 1812, but had to surrender to the British, most of their forces refusing to cross the river.

Queiros, PEDRO FERNANDES DE, 1560–1614. Portuguese seaman in Spanish service; explorer of the Pacific 1605–6; discoverer of the Hebrides and other islands.

Quenstedt, FRIEDRICH AUGUST, 1809–1889. German paleontologist and mineralogist. *Grundriss der bestimmenden Krystallographie*, 1873; *Handbuch der Mineralogie*, 1853 to 1877.

Querard, LOUIS FRANÇOIS, 1706–1749. San Domingan poet.

Quercia, JACOPO DELLA, 15th cent. Italian sculptor.

Quercite. $C_6H_7(OH)_5$. Mpt. 235° C. Hard prisms of sweet taste, soluble in eight parts water; found in acorns. It does not produce alcohol by fermentation.

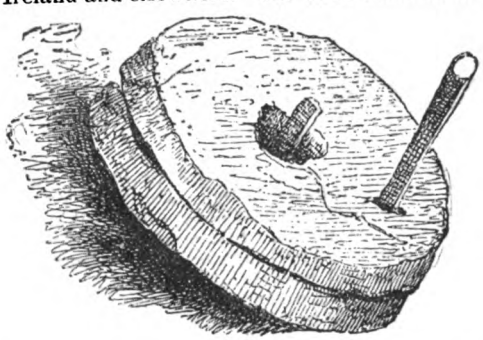
Quercitin. $C_{24}H_{16}O_{11}+3H_2O$. Lemon-yellow crystals, produced by the decomposition of quercitrin by sulphuric acid; yellow dye-stuff and a constituent of commercial flavine prepared from oak bark.

Quercitrin. $C_{36}H_{38}O_{20}$. Substance crystallizing in yellow needles, present in the quercitron oak bark and probably in bark liquor. Dilute acids charge it to quercitin.

Quercitron. *Quercus tinctoria.* Black Oak of e. N. America.

Queretaro. Capital of the State of Q., Mexico, 153 m. n.w. of the city of Mexico. It has large manufactures of cigars. Pop. ab. 36,000.

Quern. Rude mill for grinding corn by hand, still used in parts of Ireland and elsewhere. The most usual form consists



Quern.

of two flat circular stones. The grain is dropped in the central opening, while the upper stone is revolved by a handle inserted near the outer edge.

Querouaille, LOUISE DE. See PORTSMOUTH, DUCHESS OF.

Quesada, GONZALO XIMENEZ DE, 1498–ab.1596. Explorer of Colombia 1536; conqueror of Bogota, and founder of the Spanish city 1537–38. His claims to be governor were disowned by Charles V.

Quesada, MANUEL DE, ab.1830–1886. Leader of the Cuban insurrection 1868–70.

Quesada, VICENTE GASPAR, b. 1820. Argentine author and journalist.

Quesnay, FRANÇOIS, 1694–1774. French economist, founder of the school of the Physiocrates; physician and adviser of Louis XV.; encyclopedist. *Tableau Economique*, 1758; *Physiocratic*, 1768.

Quesnel, PASQUIER, 1634–1719. French Oratorian and Jansenist, in exile from 1685. He edited the works of Leo I., 1675. His *Moral Reflections on N.T.*, 8 vols., 1663–99, tr. 1719–25 and 1790, were condemned by the papal bull *Unigenitus*, 1713.

Quételet, LAMBERT ADOLPHE JACQUES, 1796–1874. Director Brussel's Observatory from 1828; writer on meteorology, physics, and statistics. *Sur l'Homme*, 1835; *Du Système Social*, 1848.

Quetelet's Law. Law connecting the phenomena of phænology and of the weather, or general principle that a given stage of growth requires given definite preceding climatic conditions.

Quetzaltenango. Second city of Guatemala, 95 m. n.w. of Guatemala City. It is the center of the trade in native cloth. Its port is Champerico on the Pacific. Pop. ab.20,000, mostly Indians.

Quevedo, José Heriberto Garcia de, 1819–1871. Spanish poet, b. in Venezuela.

Quevedo Villegas, Francisco Gomez de, 1580–1645. Spanish poet and prose satirist; Sicilian Finance Minister 1611–19; imprisoned 1639–43. *Gran Tocaño*, 1626; *Politica de Dios*, 1626; *Visions*, 1627; *Hell Reformed*, 1628. He wrote also many serious works, much fugitive verse, and some dramatic pieces.

Quezalcoatl. "Feathered Serpent," god of the wind; a Toltec divinity, averse to human sacrifices, whom the Aztecs worshiped but dreaded, and for whose return as their deliverer the Toltecs longed. The identification of Cortez with Q. paralyzed the resistance of Montezuma until too late.

Quiberon Bay. In w. France; scene of engagements between French and English, Nov. 20, 1759, and June, 1795. In the last Hoche defeated 4,000 Chouans and other royalists, supported by a British fleet.

Quichua. Chief Indian tribe of Peru, and modern representatives of the Incas; now reduced from 30,000,000 to 2,000.000. They are of an olive complexion, beardless, with well-developed bodies, large chests, and short legs. A special "Wormian" bone known as the Inca bone is present in the skull. They are distrustful of the whites, obstinate, and lazy, but kind to their families and domestic animals. The latter

Quichua Indians.

are rarely killed, even for food, and kept in the house, which is a circular hut of unhewn stone. They live principally on corn, potatoes, and barley, chew coco, and drink chicka liquor to excess. Many are peons. Little or no clothing is worn, even in cold weather. The language is guttural, but rich in words of sentiment and poetry. Erotic songs, some of which date from the time of the ancient Incas, are sung. The people are pious, nominally Catholic, but very superstitious.

Quick, Robert Hebert, 1832–1891. Anglican divine and teacher. *Educational Reformers*, 1868.

Quick Lime. Produced by burning limestone. It slakes when water is applied to it. See Mortar.

Quick-return Motions. Mechanical movements in a machine tool operating by reciprocation, by which the return traverse is made more rapidly when the tool is not cutting than the acting traverse when the tool is at work. The driving work is equalized also, as the slow stroke gives greater power to oppose the greater resistance. When the motion comes from a crank-pin, as in shapers and slotters, the Whitworth quick-return is the most usual. The driving disk revolves uniformly upon an axis of large diameter, and carries a crank-pin. This fits a slot in the crank-arm which drives the tool, the center of this last arm not coinciding with the axis of the first shaft, but eccentric to it. While the lever-arm R of the power is constant, the lever-arm of the tool-crank varies between (R+e) and (R—e), e being the eccentricity or distance between centers of the two cranks. The tool moves quickest when R is driving (R—e). For tools driven by rack and pinion movements, the quick return may be effected by one belt in connection with two trains of gear, or by two belts and one train of gear. The latter simpler plan has open and crossed belts, which are shifted by the adjustable dogs, the driving pulleys being of different diameters for the forward and the back strokes and the followers of the same diameter, or else the difference is made on both shafts. The fast pulleys on the tool are on the same shafts, and the same reducing train is driven slowly forward and fast back. With one belt and two different trains of gear, the forward motion from one belt pulley has an odd number of wheels in it with greater reduction of velocity, and the return belt pulley drives a train of gears with an even number of wheels and less reduction of speed, both trains connecting at the driving arbor of the tool. This same method has been applied, using an outside gear of small diameter and an inside gear of large size on the same shaft, so that one pulley drove the large gear forward and the other drove the smaller gear for the return. Or, again, two concentric bevel wheels were driven by wheels on opposite sides of their common center. The driving wheels of the same or different sizes drove the concentric wheels opposite ways and at different speeds. The quick-return is usually 2 to 1 or 3 to 2. See Planer, Shaper, and Slotter.

Quicksand. Bed of sand in its place in the earth, in which the cohesion of the grains is so much reduced by the pressure of water that the whole mass has a tendency to move like a liquid, when opposing resistances are removed.

Quicksilver. See Mercury.

Quietism. Mystical movement started ab.1675 by Molinos (q.v.). Its congeners were Jansenism and Pietism; its chief exponent was Mme. Guyon.

Quiller-Couch, Arthur T. ("Q."), b. 1863. English novelist and essayist. *Dead Man's Rock*, 1887; *Splendid Spur*, 1889; *Adventures in Criticism*, 1896; *Wandering Heath*, 1896.

Quin, James, 1693–1766. English comedian; prominent 1716–51, and considered the chief immediate predecessor of Garrick, who appeared 1741. His best parts were *Falstaff* and *Captain Macheath*.

Quinaldine. $C_{10}H_9N$. Methylquinoline. Liquid, bpt. 138° C., of peculiar odor, present in coal tar; isomer of lepidine.

Quinault, Philippe, 1635–1688. French dramatist, Academician 1670.

Quinby, Isaac Ferdinand, 1821–1891. Prof. Univ. Rochester 1851–61 and from 1864; Brig.-gen. U.S.A. 1862–63, serving in the West and commanding the Yazoo Pass expedition, Miss., 1863.

Quince. *Cydonia vulgaris.* Low tree of the Apple family, native of temperate Europe and Asia, widely cultivated for its edible fruit. The Japan Quince, *Cydonia japonica*, is a well-known red-flowered shrub, much planted for ornament.

Japan Quince.
a, ripe fruit; *b*, section of same.

Quincuncial. In Botany, imbricated æstivation of certain five-parted flowers.

Quincy. Capital of Adams co., Ill., on the Mississippi, 160 m. n.w. of St. Louis; founded 1822, chartered 1839. It is entered by 5 railroads, and has a good trade and extensive manufactures. It is supplied with water by pumping. Pop., 1890, 31,494.

Quincy. City of Norfolk co., Mass., 8 m. s. of Boston; founded 1625; part of Braintree till 1792; chartered 1888; noted as the birthplace of John Hancock, John and J. Q. Adams, for its granite, and for its public schools. Pop., 1890, 16,723.

Quincy, Josiah, 1744–1775. Boston patriot and orator of high degree, in England 1774. His character resembled that of Joseph Warren; his early death was a public loss.—His son, Josiah, LL.D., 1772–1864, was M.C. 1805–13, and in 1811 advocated disunion in a famous speech denouncing the Southwest. He is memorable as Mayor of Boston 1823–28, and Pres. of Harvard 1829–45. *Hist. Harvard Univ.*, 1840; *Speeches*, 1874. His *Life*, 1867, was written by his son, Edmund, 1808–1877. *Wensley*, 1854.

Quincy, Quatremere de. See Quatremere de Quincy.

Quindecagon. Polygon of fifteen sides.

Quinet, Edgar, 1803–1875. Prof. Lyons 1839, Paris 1842–46; in exile 1852–70; author of three epics, *Ahasuerus*, 1833; *Napoleon*, 1836; *Prometheus*, 1838; and of many prose works, especially *Genius of Religions*, 1842; *Merlin*, 1860; and *The Revolution*, 1865.

Quinette de Rochemont, Emile Théodore, b. 1848. French civil engineer and professional writer.

Quinidine. Mixture of cinchona alkaloids, found in trade. The commercial sulphate is largely cinchonidine sulphate. Some consider that an alkaloid called quinidine is present.

Quinine. $C_{20}H_{24}N_2O_2.3H_2O$. Intensely bitter base, prepared from Cinchona bark; white needles, mpt. 177° C. The common salts are the sulphate and chloride, both used as febrifuges. See PERUVIAN BARK.

Quinisext Council. At Constantinople 692; called as a supplement to the 5th and 6th councils 555 and 680; not recognized by R.C. Ch.

Quinnat. See ONCORHYNCHUS.

Quinoa. *Chenopodium quinoa.* Herb of the natural family *Chenopodiaceæ*, native of Peru, extensively cultivated in the Andes for its seeds, which when ground into meal are an important article of food.

Quinoline. C_9H_7N. Bpt. 236° C. Liquid, of characteristic odor and basic properties; present in coal-tar and produced by the distillation of many bases, such as quinine; prepared by the action of sulphuric acid and glycerin upon a mixture of aniline and nitrobenzene; used in the production of certain dye-stuffs.

Quinoline Blue. See CYANINE.

Quinoline Red. $C_{26}H_{18}N_2Cl$. Product of the action of benzotrichloride upon a mixture of quinaldine and a chinoline; dark brown needles, soluble in hot water; used in photography.

Quinoline Yellow. $C_{18}H_{11}NO_2$. Yellow product, prepared by the action of phthalic anhydride and zinc chloride on quinaldine; soluble in alcohol, but not in water; used to color varnishes and lacquers. The water-soluble quinoline yellow is produced by the action of sulphuric acid upon the compound described above. It is a sodium salt of a sulfo acid, and is used in dying wool.

Quinone. $C_6H_4O_2$. Mpt. 116° C. Yellow needles or prisms of a pungent odor, soluble in alcohol and ether; made by oxidizing hydroquinone. As a class the quinones are mainly yellow crystalline substances, obtained by the oxidation of paradihydroxy compounds.

Quinquagesima. Sunday before Lent.

Quinquefoliolate. Compound leaves composed of five leaflets, as the Virginia Creeper.

Quinquejugate. Pinnately compound leaves with five pairs of leaflets.

Quinquelocular. In Botany, ovaries or pericarps with five cavities.

Quinqueremes. Ancient vessels with five banks of oars. See TRIREME.

Quinsy. Inflammation of the tonsils, causing great distress and discomfort. Persons having one attack are subject to repetitions. It usually forms an abscess, which, when lanced or spontaneously ruptured, brings prompt relief.

Quintain. Post with a cross-bar from which hung a bag of sand and a board, to be tilted at by horsemen; sometimes

Quintain.

in other forms. The object was to strike the board at such speed as to be well past before the bag of sand could strike the tilter on the back.

Quintal. 100 wt., mostly for weighing fish. The old French weight was ab. 108 lbs., the modern weight is equal to 100 kilograms, ab. 220 lbs. In Newfoundland 112 lbs.

Quintana, MANUEL JOSÉ, 1772–1857. Spanish poet and biographer, imprisoned 1814–20; senator 1833. *Espanoles celebres*, 1807–34.

Quintard, CHARLES TODD, M.D., LL.D., b. 1824. Prof. Memphis Medical College 1851; took orders in the Protestant Episcopal Church 1855; Bp. of Tenn. 1865.

Quintic. Quantic of the fifth degree; as, $ax^5+bx^4y+cx^3y^2+dx^2y^3+exy^4+y^5$.

Quintilian (MARCUS FABIUS), ab.35–ab.96. Latin writer on Eloquence and Oratorical training. His chief work is *De Institutione Oratoria Libri XII.*

Quintus Curtius Rufus, 1st cent. Latin biographer of Alexander the Great. His book is unreliable: most of it survives.

Quintus Smyrnæus, 4th cent. Greek epic poet, whose *Posthomerica*, in 14 books, completes the story of Troy from the point where the *Iliad* leaves it. His style is not attractive.

Quipu. Means of conveying instructions, commands, and records by knotted cords, used in Peru before the conquest.

Quirinal. One of the hills of Rome, n.e. of the Forum.

Quirinus. See ROMULUS.

Quirites. In ancient Rome, burgesses, or warrior-citizens; sometimes citizens as opposed to soldiers. Mommsen says the word originally meant lancemen: others derive it from Cures, a Sabine town incorporated with Rome.

Quitch Grass. See COUCH GRASS and QUACK GRASS.

Quit-Claim. Conveyance of such title as the grantor has, without covenants of any kind.

Quitman, JOHN ANTHONY, 1799–1858. Chancellor of Miss. 1828–34; Brig.-gen. U.S.A. 1846; highly distinguished in the war with Mexico; Gov. of Miss. 1850; M.C. from 1855; advocate of extreme Southern ideas, anticipating 1851 secession and the Confederacy.

Quito. Capital of Ecuador; on e. slope of the volcano Pichincha, 9,300 ft. above the sea; subjected to the Incas ab.

Market Scene in Quito.

1470; taken by Spaniards 1534. An earthquake in Feb., 1797, destroyed ab. 40,000 persons; another, March, 1859, ab. 5,000. Pop. ab. 35,000.

Quit Rent. Certain established rents of the freeholders, which when paid make the tenant quit and free of all other services.

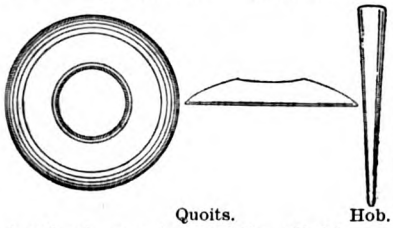
Quittor. Ulcer or abscess of the foot of a horse, due to a nail prick, thrush, or bruise which may finally attack the pedal bone.

Quoin. In Architecture, a squared stone, employed at the

angles of walls or in the frames of openings, in connection with rubble or brick-work, in order to secure a true line, or to strengthen the wall.

Quoin. Corner of a masonry wall projecting beyond the two faces, so as to give the appearance of a corner pier.

Quoits. Game is played by any number, usually even, sides being chosen. It consists of pitching round metal disks, convex on the top and flat on the bottom, with an aperture in the center, at a peg called a hob, set in the ground and projecting therefrom ab. 2½ in. There are two of these hobs, set 18 or 21 yds. apart, for large or smaller quoits. The players stand at one hob while pitching for the other. The side having one, two, or more quoits nearer the hob scores accordingly. The game was probably derived from "throwing the discus" of the Greeks and Romans.



Quorum. Number of members of a body whose presence is requisite for the transaction of business. T. B. Reed, as Speaker of the House, ruled, Sept. 1890, that a quorum was determined by the number present, whether voting or not. It had previously been ascertained by the votes actually cast.

Quotidian. That which takes place every day. Quotidian fever is an intermittent, the paroxysms of which occur every day. It may be simple, double or triple, according to the number of paroxysms occurring in 24 hours.

Quotient. Result of division; expression showing how many times one quantity is contained in another.

Quo Warranto. Old common-law writ to inquire by what authority a person or corporation held an office or exercised a franchise.

R

Ra. Ancient solar deity of Egypt, worshiped especially at Heliopolis.

Raabe, WILHELM, b. 1831. German humoristic novelist. *Horacker*, 1876; *Der Lar*, 1889.

Rabanus, or **Hrabanus,** MAURUS, ab.776–856. Abbot of Fulda 822–842, Abp. of Mainz 847; eminent for learning; opponent of transubstantiation and predestination.

Rabat. Seaport of Morocco, now much impaired; on the Atlantic; noted for its carpets and other manufactures. Pop. ab. 26,000.

Rabaud, CHARLES HECTOR, 1711–1764. Writer on the laws, etc., of the French West Indies. His work, 6 vols., 1761–65, is of historical value.

Rabbis. Jewish teachers of the Law; authors or compilers of a large body of literature, of which the most important examples are the Mishnah and Talmud, with sundry commentaries upon them.

Rabbit. See LEPUS and HARES.

Rabelais, FRANÇOIS, ab.1495–1553. French humorist, originally a Franciscan monk. His *Gargantua*, 1532, burlesqued familiar legends, and was continued in a higher vein in *Pantagruel*, 1535–63, whose breadth and freedom of thought provoked much criticism: it bears marks of learning as well as of riotous mirth. He held benefices, practiced medicine, made almanacs, and was a more reputable person than the legends represent him.

Francois Rabelais.

Rabener, GOTTLIEB WILHELM, 1714–1771. German satirical poet.

Rabenhorst, GOTTLOB LUDWIG, 1806–1881. German botanist; prolific writer.

Rabies. See HYDROPHOBIA.

Rabourdin, HENRI ÉTIENNE, 1711–1764. French abbot, writer on America.

Rabshakeh. Assyrian officer, herald of Sennacherib's invasion of Judea 702 B.C.; mentioned Isa. xxxvi.; perhaps title rather than name.

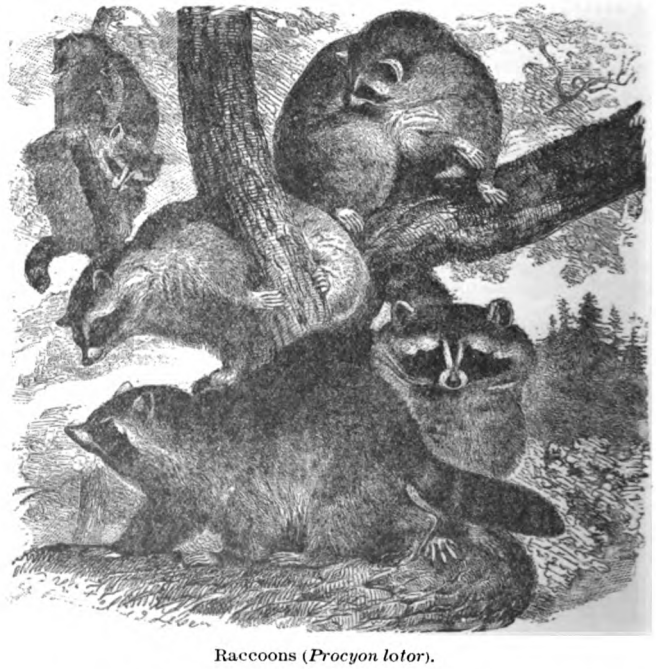
Rabulas, d. 435. Bp. of Edessa; strict promoter of orthodoxy. Some of his works survive, and were pub. 1865.

Rabutin. See SÉVIGNÉ.

Racahout. Arabian substitute for chocolate; a preparation of roasted acorns powdered with sugar and aromatics.

Racan, HONORAT DE BUEIL, MARQUIS DE, 1589–1670. French poet and Academician.

Raccoons. *Procyon lotor*, the common "coon," is found in all woods of U. S. It is 3 ft. long, including tail of nearly a foot. Its fur is extra dense, gray in color mixed with black, and tail ringed. The body is stout; the muzzle pointed, with a black stripe across the face. It walks either planti-



Raccoons (*Procyon lotor*).

grade or digitigrade. It is fond of eggs, chickens, green corn, and fish, and souses ordinary meat in water before swallowing it. It can be tamed. Its cunning is proverbial among hunters. It nests in trees or in holes in banks. Three to six young are born at a time. California has the Black-footed Raccoon (*P. hernandezii*), and in S. America is *P. cancrivorus*, the Crab-eater. See PROCYONIDÆ.

Race, CAPE. Southeast point of Newfoundland.

Raceme. Elongated, indeterminate flower-cluster, having the flowers borne on pedicels of about equal length, as in the Lily of the Valley and Locust.

Racemic Acid. Optically inactive form of TARTARIC ACID (q.v.).

Racemose. Flowers arranged in racemes, or forms of flower-clusters resembling racemes.

Racemose Vesicles. Branched water-sacs that project upward from the circumoral ring into the body cavity of a star-fish. They are nine, one for each radius and interradius, except the one occupied by the Stone Canal.

Racemulose. Diminutive of racemose.

Races of Men. See MAN.

Rachel. Daughter of the Mesopotamian Laban, wife of his nephew Jacob; mother of Joseph, and ancestress of the tribes of Ephraim, Manasseh, and Benjamin.

Rachel (ÉLISA RACHEL FELIX), 1820–1858. French tragic actress of highest rank, born a Swiss Jewess; famous from 1838; unsurpassed, if not unequaled, in passionate parts, as Phèdre and Marie Stuart.

Rachidian Teeth. Those of the rachis or central row of the lingual ribbon (radula) of the Gastropods.

Rachilla. In Botany, axis of the spikelet in *Gramineæ*.

Rachis, or RHACHIS. Axis of elongated flower-clusters; also the midrib of compound leaves, especially those of ferns.

Rachitis, or RHACHITIS. See RICKETS.

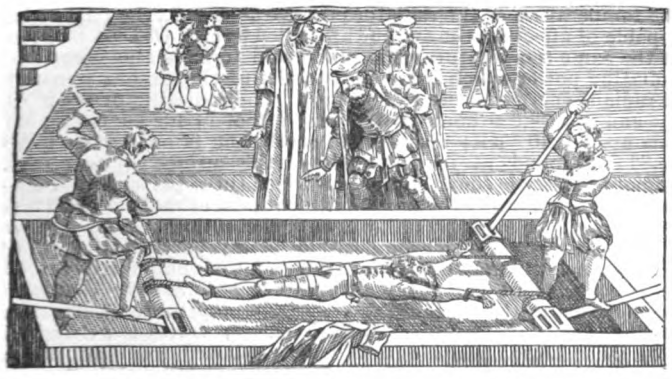
Racine. Capital of R. co., Wis., on Lake Michigan; founded 1836, chartered 1848; seat of R. Coll., established by P. E. Ch. 1852. It has considerable manufactures, and a good lake trade. Pop., 1890, 21,014.

Racine, JEAN BAPTISTE, 1639–1699. French tragic dramatist of the first rank; Academician 1673. His masterpieces are *Iphigénie*, 1675; *Phèdre*, 1677; *Esther*, 1689, and *Athalie*, 1691. Other plays are *Andromaque*, 1667; *Britannicus*, 1667; *Bérénice*, 1670; *Bajazet*, 1672; *Mithridate*, 1673; and a comedy, *Les Plaideurs*, 1688.—His son LOUIS, 1692–1763, wrote *Religion*, 1742, and other serious poems.

Racing. The record for pacing one mile was lowered to 1.59¼ seconds by Star Pointer and the double team record to 2.09¼ seconds by John R. Gentry and Robert J. in 1897. See HORSERACING.

Rack. In Ore-dressing, form of apparatus in which small charges of pulp are separately treated on a smooth inclined surface, the poorer portions running to waste and the richer being washed off at frequent intervals.

Rack. Machine of torture used from ancient times to force confessions; wooden frame on which the accused lay,



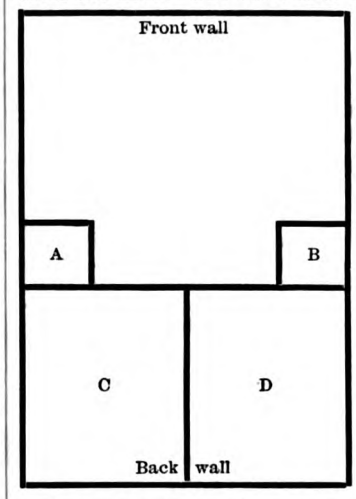
The Racking of Cutbert Symson, in the Tower of London.

while his legs and arms were stretched to dislocation by a windlass. Its employment was long general: in England this extended 1447–1628.

Rack. Toothed wheel whose radius is infinity or whose pitch surface is a plane (see GEAR WHEELS); useful to transform rotary into reciprocating motion; also fixed arcs of toothed surfaces with finite radius, upon which a pinion rolls for moving drawbridge spans, turntables, etc.

Rackarock. Sprengel explosive, 79 per cent potassium chlorate and 21 nitrobenzene for maximum intensity, which under water is 1.08 times that of No. 1 dynamite. It was used to blow up Flood Gate in N. Y. Harbor. It will explode by percussion.

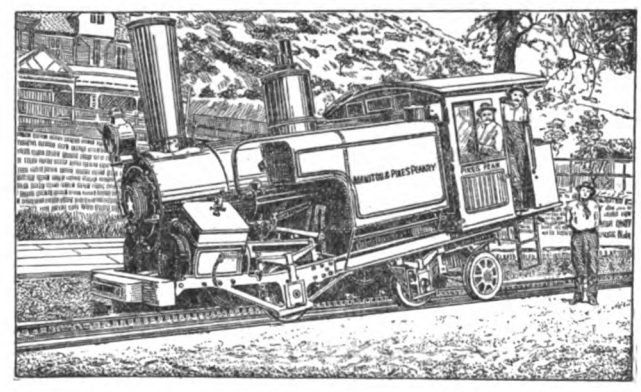
Rackets. Later variety of game with bat and ball, derived from Tennis (see COURT TENNIS). A racket-court may be from 50 to 80 ft. long, and 30 to 40 wide, with a very high roof and a back wall of less height, having at its top a gallery for spectators. Running along the front wall, which is usually black, is a board or balk a little over 2 ft. high, and a white line called the cut line is traced across this wall nearly 8 ft. from the floor. The floor is of level asphalt and divided into sections (see diagram). The game is begun by one of the players serving the ball against the front wall above the white line so that it shall on the rebound strike in either C or D, according as he serves from B or A. The opponent then returns it either on the fly volley or first bound, so that it strikes the front wall above the lower line.



A and B. The server must have one or both feet inside one of these spaces when serving.

C and D. The spaces into which the server must send the ball on the rebound from the front wall. If he serves from B, the ball must strike in C; if from A, in D.

Rack Railroads. Those having rails with pinions which engage in cogs on the locomotive wheels, so as to permit the ascent of steep grades. In the Abt system there are three series of racks so alternating that a tooth of the wheel is always between two pinions. In the Riggenbach system a series of horizontal bars like rounds of a ladder is used. Friction clutches are also employed as an additional safeguard.



Rack Railroad.

Rack railroads have been built on Mt. Pilatus in Switzerland and up many other mountains of Europe. Pike's Peak, Col., is ascended by a rack road on the Abt system, its length being 8¾ miles and its rise 7,600 ft.; the locomotives weigh 25 tons and push two loaded cars up the grade at a speed of ab. 4 miles per hour. Mt. Washington, N. H., is ascended by a road having a maximum grade of 1,980 ft. per mile, a rack rail of simpler type than the Abt being used.

Rack Rent. Rent whose amount is determined by open competition in a country where land is in demand, instead of being either of a customary amount or settled by private arrangement.

Radbertus, PASCHASIUS, ab.790–865. Benedictine; Abbot of Corbie, n. France, 844–851; canonized 1073, chiefly for his book on *The Lord's Body and Blood*, which urged the doctrine since called transubstantiation.

Radcliffe, MRS. ANN (WARD), 1764–1823. English romancer. Her *Mysteries of Udolpho*, 1794, and other wild tales were long popular.

Radcliffe, CHARLES BLAND, M.D., 1822–1889. English medical writer. *Epilepsy*, 1854.

Radcliffe, JOHN, 1650–1714. London physician of eminent popularity; M.P. 1713.

Radcliffe College. At Cambridge, Mass.; was chartered 1893. It grew out of "A Society for the Collegiate Instruction of Women," organized 1878, and was known for a time as The Harvard Annex, instruction being given by some of the Harvard faculty. Its degrees are signed by the Pres. of Harvard. It has 90 instructors, 358 students, and a library of 9,734 vols.

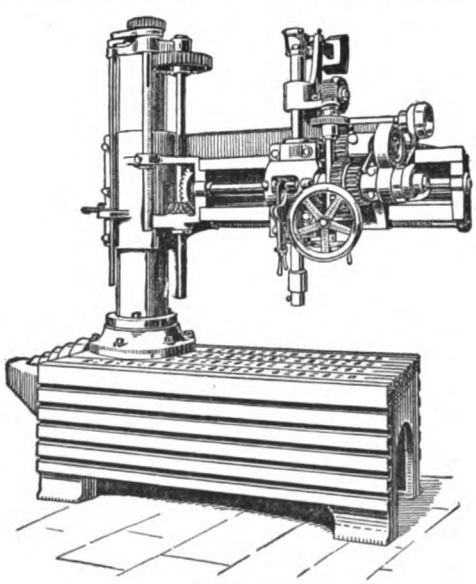
Raddi, GIUSEPPE, 1770–1829. Italian explorer in Brazil 1817; writer on its cryptogams and plants, 1822–25.

Radetzky, JOHANN JOSEPH, GRAF VON, 1766–1858. Austrian officer, field-marshal 1836; distinguished in the wars against Napoleon, and 1848–49 in n. Italy, where he suppressed the risings and was Gov. till 1857.

Radford, WILLIAM, U.S.N., 1808–1890. Commander 1855, Commodore 1863, Rear-admiral 1866; prominent in the attack on Fort Fisher Dec. 1864, and its capture Jan. 1865.

Radial Canals. Tubes that radiate from the central stomach, to open into a circular canal at the margin of the umbrella of *Medusæ*.

Radial Drill. Form of machine tool for drilling, in which the revolving spindle is carried upon a horizontal arm or radius, which swings around an upright column. The spindle carriage can be traversed horizontally along the radius, to adjust the point of the tool over the center of holes in a heavy



Radial Drill.

work which it would be hard to locate under a fixed spindle. Moreover, the spindle can operate easily on end of work too tall to stand under ordinary upright drills. Sometimes, though rarely, the radius has horizontal adjustment on the column. See DRILL.

Radial Plates (or RADIALIA OF CRINOIDS). See BASAL PLATES.

Radial Symmetry. Displayed in radiated animals, as jelly-fishes, star-fishes, and coral polyps. Their bodies are divisible into a number of similar segments. In some corals and in ctenophores there are two kinds of segments, one sort being situated at right angles to the other; such symmetry is biradial. The radial axes through the center of each sector are known as perradii; those that separate the sectors are interradii; those that lie on each side of a perradius are adradii, while those near interradii are subradii. See ANTIMERES, PARAMERES, and ACTINOMERES.

Radial Valve Gear. Type of mechanical motions, to which the Joy, Brown, and Marshall gears belong, for operating the valves of steam engines, and permitting a variable cut-off and reversal of the direction of motion of engine. The eccentric rod proper is usually at right angles to the valve stem, which is pinned to the former at one point, and while one end of the eccentric rod travels in a closed curve, such as a circle or an ellipse, another point is compelled by links or slides to a motion in an open or closed curve. The variation in cut-off and the reversal are made by varying the angle which the axis of this last curve makes with the mean line of direction of the eccentric rod.

Radian. Circular arc, equal in length to the radius of the circle; used as the unit in arcual or "π" measure of arcs and angles. The radian $= 57° 17' 44.8''$ in degree measure. Its ratio to the semi-circumference is $3.14159+(\equiv \pi)$.

Radiant. Large, neutral flowers of certain shrubs of the genera *Viburnum*, *Hydrangea*, and others.

Radiant Energy. Any wave motion in the ether. See RADIATION.

Radiant Heat. Misnomer for radiation of wave-length longer than that of visible radiation. See RADIATION.

Radiant Matter. Fourth form of matter, called by Faraday 1816 "as far beyond vaporization as that is above fluidity." When the gaseous contents of a glass globe have been rarefied to an extreme degree, the residue assumes peculiar properties. That these properties may manifest themselves, the mean free path of the molecules must be at least as long as the largest dimension of the inclosing tube. A body of particles in this condition is known as a Crookes' layer. If the discharge of an induction coil be passed through the tube, the particles of radiant matter seem to shoot off in straight lines from the negative pole with very great velocity; often in coming in contact with solid matter, glass, for instance, brilliant phosphorescence is produced. The colors are various and characteristic, and thus a new field for the spectroscope has been opened. Radiant matter is also capable, when electrified, of producing many interesting mechanical effects. If the stream of molecules be directed upon the vanes of a small revolving wheel, it will arrest or produce great velocity almost immediately. If the negative pole within the tube be a concave surface, so that the particles are directed to a focus on a platinum strip, the latter may be heated nearly to the fusing point. Very elaborate and ingenious experiments have lately been made on this ultragaseous state of matter by W. Crookes. See CROOKES' TUBES.

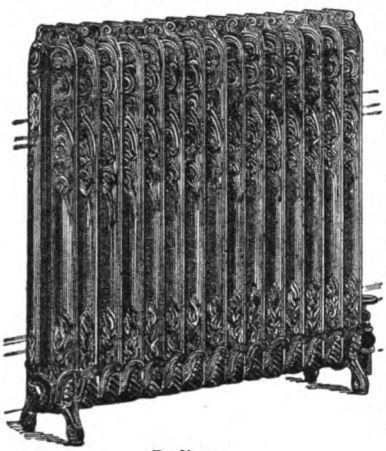
Radiata. Animals possessing radial symmetry; now included in the Cœlenterates and Echinoderms.

Radiating Power. Property of emitting a greater or less quantity of radiant energy. Lampblack is one of the best radiators known. The radiating and absorbing powers of bodies are found to be equal in value, good radiators being good absorbers. Polished surfaces are poor radiators. See ABSORBING POWER, RADIATION and NON-CONDUCTORS.

Radiation. Process of energy transference from one source to another by a wave motion, propagated by transverse vibrations in the so-called luminiferous ether. [The ether wave-motion itself is sometimes called radiant energy.] Radiation is set up in the ether by the vibration of the molecules of ordinary matter. It may be due entirely to the motion of the molecule as a whole, or partly to the vibrations of the parts of the molecules, this latter condition being similar to that of a plate when vibrating in segments. All bodies not at the absolute zero of temperature are radiators. The minimum wave length of the radiant energy sent out is an inverse function of the absolute temperature of the body, though all waves longer than this minimum are present at the same time. If the temperature of the radiator is above ab. 525° C., the rays are capable of affecting the eye and are called light. Of two bodies at the same temperature, that one is said to have the greater radiating power which is capable of emitting the larger amount of radiant energy per unit of surface. The radiating power of the sun is ab. 7,000 horse-power per sq. foot of his surface: of this ab. $\frac{1}{225} \times 10^{-7}$ part reaches the earth, and is equivalent to ab. 83 foot-pounds per sq. foot of the earth's surface per second. Radiant energy is sometimes divided into three parts, for convenience of reference; viz., radiant heat (sometimes called the DARK HEAT [q.v.] rays), light, and the actinic rays. The actinism or power of decomposition of any particular set of rays depends entirely upon the nature of the compound to be affected; hence it cannot be said that the actinic rays occupy one position in the scale of wave-lengths any more than another. The wave-length of radiant energy varies through a very wide range. The length of waves radiated from a piece of ice have been measured by Prof. Langley. From this lower limit we pass through the range of the visible rays, *i.e.*, from ab. $\frac{1}{18000}$ of a centimeter to ab. $\frac{1}{25000}$ of a centimeter, to the shortest waves which can be rendered visible only by fluorescence. The vibration frequency is said by Langley to lie between the limits of ab. 107×10^{12} and ab. 40.000×10^{12} per

second, comprising by musical analogy ab. 8.5 octaves. Of these light occupies hardly one octave, the limits of frequency being ab. 392×10^{12} and 757×10^{12} per second.

Radiator. Closed vessel within which steam or hot water circulates to keep it hot, and which heats objects by radiation of its heat, and air by contact for warming buildings. The simplest is a coil of wrought-iron pipe, of ¾″ or 1″ in diameter, the rows of pipes being joined at the ends into return bends or into a header or manifold or special base casting at one of the ends. The efficiency of the pipe surface has been increased by adding an amount of coiled flat wire, fastened to the outside of the pipe, which increases the area of the heating surface, especially for air warming by contact. Cast-iron radiators are best of the pin-type, which also acts most efficiently on air by contact. In direct radiators for apartments, ab. half a sq. ft. is allowed per sq. ft. of condensing area, or one sq. ft. of heating surface per hundred cubic feet of volume; for indirect radiation, where the radiators are in a cellar or out of the room, and warmed air is to enter through flues, the allowance is made one and a half times or twice that for direct radiation.



Radiator.

Radical. In Chemistry, group of atoms which behave as a whole in any reaction, or one of the groups of atoms serving to make up a molecule. Thus C_6H_5, phenyl, is a radical in diphenyl, C_6H_5-C_6H_5.—In Botany, organs approximate to the root, as radical leaves.

Radical Axis OF TWO CIRCLES. Straight line from any point of which tangents to the circles will be equal. If the circles intersect, it is their common chord indefinitely extended.

Radical Center. If three circles be taken in pairs, the three radical axes will meet at a common point so called.

Radicals. Algebraic expressions subject to a sign indicating that some root of the expression is to be taken. The radical sign is $\sqrt{}$. This sign is followed when necessary by a vinculum covering the expression subject to the sign. The radical sign without index denotes square root: in other cases the root to be taken is shown by an index to the left and just above the radical sign. Radicals of any degree may also be indicated by fractional exponents having the index of the root as denominator. The calculus of radicals is best discussed by means of the fractional exponents modifying the fundamental rules for combination to meet the fractional character of the exponents.

Radicals. English Liberals of the extremer sort, aiming at thorough political reform, with a more or less clear and conscious tendency to democracy. They came into being ab. 1790. Similar parties or schools exist in every free or partially free country.

Radicant. Plants producing aerial or secondary roots.

Radication. Arrangement of roots of a plant either in the soil or with relation to each other.

Radicellati. See CYCLOSTOMATA (*Molluscoida*).

Radicle. Rootlets of Mosses. See CAULICLE.

Radicolous. Plants parasitic on the roots of others.

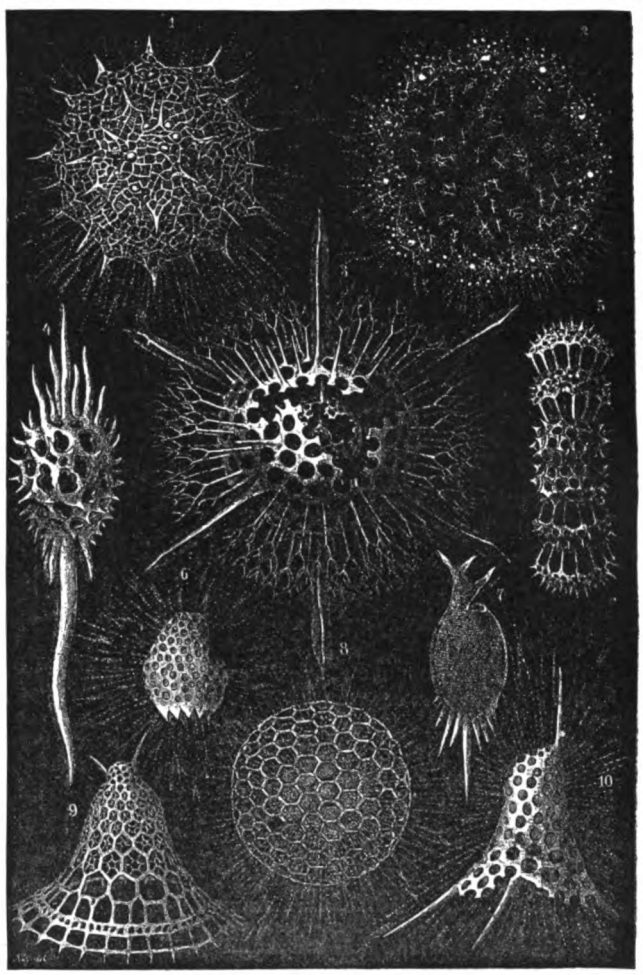
Radiculose. Plants or parts of plants bearing numerous rootlets; used especially in Bryology.

Radient of Meteoric Showers. Point in the heavens from which the paths of the meteors appear to radiate during a meteoric shower.

Radii of Radiates. See RADIAL SYMMETRY.

Radiograph. Invention of Olivier, designed to regulate the time of exposure of photographic plates by the mechanical action of the light rays. It consists essentially of a radiometer connected to a very light and delicately constructed speed indicator. In strong sunlight the vanes of the radiometer will rotate more rapidly and cause the index to advance step by step at a proportionally more rapid rate, but when exposed to a weaker light the pointer will require a longer time to traverse the spaces between the graduations. Thus the measure of the light action for any given time is obtained.

Radiolaria. Class of Rhizopods, including forms that resemble the *Heliozoa*, but are marine, and have a central capsule and no contractile vesicle. They usually have a silicious skeleton, which is either all outside the capsule (*Ectolithia*) or partly within it (*Entolithia*). They may be solitary (*Monozoa*)



Radiolaria.

or colonial (*Polycyttaria*). The skeleton may consist of spicules loosely joined, or of complicated radiating spokes, penetrating latticed concentric spheres. Yellow cells are often present. See SILICOSKELETA and ACANTHOMETRIDÆ.

Radiometer. Instrument devised by Dr. Crookes, and depending for its action upon the properties of a Crookes' layer. It consists of a small highly exhausted bulb of glass, in the middle of which are fixed upon a freely rotating vertical shaft four radial arms in the form of a rectangular cross. At the end of each arm is a little aluminium disk with its plane vertical and blackened on one side. The black surface absorbs radiant energy, while the bright side reflects it. The reaction of each molecule then, when it comes in contact with the black face of the vane, is more energetic than the impulse of a similar molecule on the cooler reverse side. When the instrument is placed in the path of any radiation whatever, these unbalanced forces will tend to produce rotation of the flies, bright side foremost.

Radiophone. Instrument constructed for converting the energy of an intermittent beam of light or radiant energy into that of sound. If such a beam be incident upon some surface readily capable of rapid changes of temperature, the surface will expand and contract: if these changes succeed one another with sufficient rapidity, a sound will result. It has been shown that the amplitude of the motion may exceed the ten-millionth part of a centimeter. Graham Bell has pointed out that the properties required for this conversion are possessed by nearly all substances.

Radish. *Raphanus sativus.* Fleshy-rooted herb of the natural family *Cruciferæ*, unknown in the wild state, cultivated from remote antiquity, and supposed to have been derived from *R. raphanistrum*, which is native of Europe and widely diffused as a weed in America.

Long-rooted and Turnip-rooted Radishes.

Radius. Constant distance from a fixed point to any point on the circumference of the circle, or surface of the sphere, of which the fixed point is the center.

Radius. Second vein of an insect's wing, counting from the anterior margin.

Radius-Arc. Arc used on the surface of a sphere to describe, from a fixed point called the pole, any circle on that sphere.

Radius of Curvature OF ANY CURVE. Radius of the osculatory circle at the given point.

Radius of Gyration. See GYRATION, RADIUS OF, and MOMENT OF INERTIA.

Radius of Oscillation. See PENDULUM.

Radius Vector. 1. One of the co-ordinates in the polar system. 2. Variable distance from a fixed point called the pole to a moving point.

Radowitz, JOSEPH MARIA VON, 1797–1853. Prussian officer, diplomatist, and writer. *Schriften*, 5 vols., 1852–53.

Radula. Lingual ribbon; movable, tape-like structure, carrying transverse rows of teeth. It lies on the ventral wall of the œsophagus of univalve Mollusks.

Rae, JOHN, M.D., LL.D., 1813–1893. English Arctic explorer, who went in search of Sir John Franklin 1848–51, and found the first signs of his fate.

Raeburn, SIR HENRY, 1756–1823. Scottish portrait-painter; R.A. 1815, knighted 1822.

Raff, JOSEPH JOACHIM, 1822–1882. Swiss composer in all forms, but chiefly successful as symphonist; early and enthusiastic champion of Wagner and his theories. His compositions number over 200 and include an opera, *König Alfred*, 1851, eleven symphonies, an oratorio, several overtures, suites, concertos, chamber pieces, pianoforte pieces, and songs.

Raffinose. $C_{12}H_{22}O_{11},3H_2O$. Melitose; species of sugar found in the sugar beet and molasses in small quantities. Its appearance is like that of cane sugar, but is nearly tasteless. It does not reduce Fehling's solution.

Raffles, THOMAS, D.D., LL.D., 1788–1863. Cong. pastor at Liverpool 1812–61; hymnist.

Raffles, SIR THOMAS STAMFORD, 1781–1826. Lieut.-gov. of Java 1811–16, and of Bencoolen, Sumatra, 1818–23; knighted 1817. *Hist. Java*, 1817.

Rafinesque, CONSTANTINO SAMUEL, 1784–1842. Prof. Transylvania Univ. 1818. *Florula Ludoviciana*, 1817; *Medical Flora*, 1828–30; *Botany of N. America*, 1836; *Conchology*, 1864.

Rafn, KARL CHRISTIAN, 1795–1864. Danish antiquarian, prof. Copenhagen 1826. *Antiquitates Americanæ*, 1837.

Rafter. Beam or joist of a roof laid parallel to the main trusses, and serving to support the purlins or the roof covering. In large roofs the rafters are made of iron or steel angles and plates. The lower end of a rafter, if supported by a wall, exerts a horizontal thrust upon it which often renders necessary a tie rod.

Raga Raga. Malay name for the ball used in the most popular athletic game in s.e. Asia. The ball consists of intertwined rings of rattan, and is thrown from any part of the body, including the foot, but may not be touched with the hand. The game is played in Siam, Burmah, the Malay Peninsula, and the Philippines.

Ragged Schools. Begun in England 1819 by John Pounds (d. 1839), a Portsmouth cobbler; urged and extended by Dr. T. Guthrie of Edinburgh 1847; first opened on Sunday in London 1838; first supplied with food at Aberdeen 1841. They have done much to lessen juvenile offenses.

Ragging. Preliminary breaking by hand and rough classification of ore for further mechanical treatment. The work is performed with hammers weighing from 6 to 8 lbs.

Raglan, FITZROY JAMES HENRY SOMERSET, BARON, 1788–1855. English soldier, prominent in youth in Spain and at

Lord Raglan.

Waterloo, where he lost an arm; knighted 1815; Baron 1852; commander in the Crimea 1854, where he won great victories and endured a severe defeat; Field-marshal Nov. 1854.

Ragman-Roll. Collection of parchments kept in the Tower of London, on which the Scottish nobility and clergy subscribed their allegiance to Edward I. 1296.

Ragnarok. Norse destruction of the earth and the gods, heralding a new order.

Ragozin, ZENAIDE, b. ab.1835. Russian-American writer, especially on ancient history of the East.

Raguet, CONDY, LL.D., 1784–1842. U. S. Consul at Rio Janeiro 1822–27. *Free Trade*, 1835; *Currency and Banking*, 1839.

Ragusa. Dalmatian town, on the Adriatic; important and powerful in the Middle Ages; held by Austria since 1815; now greatly decayed. Pop., 1891, 7,143. See GRAVOSA.

Ragweed. Plants of the genus *Ambrosia*, weeds of the Composite family, natives of N. America.

Ragwort. *Senecio aureus.* Yellow-flowered herb of the natural family *Compositæ*, native of N. America; known also as Squaw-weed; also other species of the genus.

Rahab. Woman of Jericho, who entertained and concealed the spies sent out by Joshua, was spared by the Israelites, married to a Jewish prince, and became an ancestress of Christ.

Rahbek, KNUD LYNE, 1760–1830. Danish poet, dramatist, and editor.

Raikes, ROBERT, 1735–1811. English printer of Gloucester, founder of modern Sunday-schools, 1780.

Rail Bender. Apparatus for curving railroad rails;

Hydraulic Rail Bender.

either portable like a Jim Crow, or made of other rails and cross-ties, upon which the bending is done by a lever. It has

two curved branches on which the rail rests, while a powerful screw or a hydraulic plunger is brought upon a point midway between them.

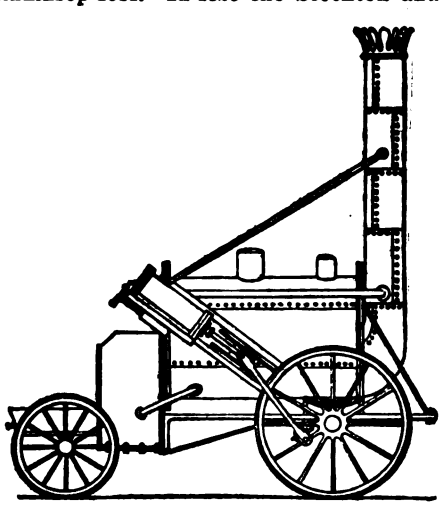
Railroad Accidents. The number of train accidents in the U. S. in 1895 was 1,487, of which 602 were due to collisions, 810 to derailments, and 75 to other causes. In these accidents 1,811 employees, 170 passengers, and 4,155 other persons were killed. In 1892 in Great Britain one passenger out of 6,701,000 was killed, in U. S. one out of 2,984,832 in 1895; in U. S., 1895, one out of 213,651 was injured; of employees, one out of 433 was killed and one out of 31 injured: of trainmen, one out of 155 was killed and one out of 10 injured. The increasing use of the block system and of automatic car couplers tends to decrease the number of accidents. "Other persons" includes casualties at stations and crossings and trespassers.

Railroad Bagatelle. Game resembling Tivoli, in which balls are rolled down an inclined trough or a spiral tube upon a board containing pins, and numbered holes or stalls.

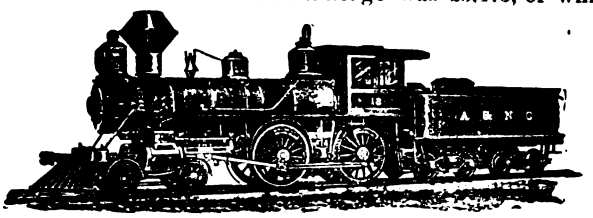
Railroad Gauge. Distance between the inner sides of the heads of the rails; for the standard gauge 4 ft. 8½ in. The standard gauge is used for main lines in U. S., England, France and Germany, the narrow gauges of 3½ and 3 ft. being adopted only for branch roads in mountainous districts. Ireland has a gauge of 5 ft. 3 in.; Spain and Portugal have 5 ft. 6½ in.; in India 5 ft. 5½ in. is mostly used. Of the total railroad mileage of the world 76 per cent is of standard gauge, 10 of larger, and 14 of smaller gauges. See BATTLE OF THE GAUGES.

Railroad Rails. The earliest tramway rails were of wood or stone, but in 1805 cast-iron rails ab. 5 ft. long were introduced. Ab. 1820 a strap rail of wrought-iron fastened upon longitudinal wooden stringers came into use. These were soon followed by the double-headed rail, which is still used in England. The rail with flat base was invented by R. L. Stevens, and first used 1831 on the Camden and Amboy R.R. The cross-section of the early rails was pear-shaped, but this has been gradually modified to the present form, the head being with sides almost vertical while the web is comparatively thin. Prior to 1860 rails were rolled of wrought-iron, but the invention of Bessemer 1862 caused steel to be used, and the cost of production has been lowered from $150 to $20 per ton. The weight and size of rails has gradually increased with the growth of traffic and the decrease in their cost. The minimum weight now used is 50 or 60 lbs. per yard, while 80, 90 and 100 lbs. per yard are frequently found on roads of heavy traffic. The average distribution of the metal in the best forms is ab. 42 per cent in the head, 21 in the web, and 37 in the base.

Railroads. At the beginning of the 19th century a number of tramways were in use in Great Britain for transporting coal and freight; these had timber or cast-iron rails, and the motive power was horses. The first locomotives were introduced by Trevithick 1804, who used waste steam in the chimney for draft, and by Blinkinsop 1811. In 1825 the Stockton and Darlington road, 38 m. long, was opened, and a train weighing 90 tons was drawn at a speed of 5 m. per hour by an engine built by George Stephenson. In 1829 the Liverpool and Manchester road was opened with a train weighing 12¾ tons drawn at an average speed of 13.8 m. per hour by an engine, the *Rocket*, weighing 4½ tons, built by Robert Stephenson; a maximum speed of 29 m. was attained. In the U. S. railroad construction began 1826, when a tramway for transporting stone was built at Quincy, Mass.; in 1827 one for coal traffic was built at Mauch Chunk, Pa.: horses were used in both cases. The first locomotive was operated at Honesdale, Pa., on the Delaware and Hudson road, by Horatio Allen, on Aug. 8, 1829. In 1830 the Baltimore and Ohio, the S. Carolina, the Mohawk and Hudson, and the Camden and Amboy railroads were under construction, and soon after locomotive power was rapidly introduced. The railroads of the world in 1840 had a total length of 4,933 m., of which 2,117 m. were in Europe, and 2,816 m. in U. S. In 1850 the total mileage was 23,473, of which



The Rocket.



Modern Locomotive.

14,458 was in Europe and 9,015 in U.S. The rapid growth since 1850 is shown by the following table of miles in operation:

	1860	1870	1880	1890
Europe	32,147	64,153	104,733	133,007
Asia	840	5,085	9,856	20,031
Africa	296	950	2,878	5,791
Australasia	347	1,035	4,858	11,128
United States	30,600	52,856	93,526	161,397
Canada	1,880	2,670	6,886	13,436
Central America		215	1,765	6,234
South America	371	2,021	6,618	16,430
Total	66,481	128,985	231,120	367,455

At the close of 1896 the number of miles of railroad in U.S. was 182,600, and in the world 405,583. The total railroad capital of U.S. was $12,107,853,637, of which 45 per cent was in stock, 46 in funded debt, and 9 in other forms. The average cost of construction has been $47,000 per mile, and that of equipment $5,000. The number of passengers carried one mile was 13,054,840,243, and of the tons of freight carried one mile 93,885,853,634. The average cost of carrying a passenger one mile is 1.91 cents; the revenue received is 2.14 cents. The average cost of carrying one ton of freight one mile is 0.58 cents; the revenue received is 0.89 cents. The average cost of running a train one mile is 97 cents, the revenue received 147 cents. The net earnings are less than 4 per cent upon the capital invested.

Railroad Weather Signal. Introduced by the Ohio State Weather Service 1881, to be borne on the side of a baggage or freight car, and changed daily by orders from the central weather bureau, announcing the weather to be expected during the next 24 hours; subsequently adopted by U.S. Signal Office and all State Weather services.

Rails (MARSH HENS). Grallatory birds of relatively small size, with long toes, short wings, fairly long bill and legs, and a turned-up tail. They are strong fliers, but prefer to run when pursued. They nest in the long grass of marshes. The plumage is dun or mud-colored, streaked with ashy and dark bars posteriorly. *Rallus elegans*, Fresh-water Marsh Hen, is 18 in. long and with ruddier color, while *R. longirostris* (*crepitans*), the Clapper Rail of salt marshes, is 15 in. long, with a more ashy brown hue. The former has one, the latter two broods in a season. The Virginia Rail and the Sora resemble the *elegans* and *crepitans* respectively, but are only 9 or 10 in. long.

Raimondi, ANTONIO, 1826–1890. Naturalist, b. at Milan; prof. at Lima from 1851. *El Peru*, 3 vols., 1874–97. His explorations, collections, and notes furnish material for 20 vols.

Raimondi. See MARK ANTONIO.

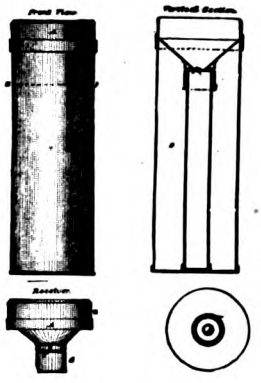
Rain. The amount of moisture contained in a cubic foot of saturated air increases with the temperature, being 2.13 gns. at 32° F., 4.09 at 50°, 6.15 at 62°, 7.99 at 70°, 10.90 at 80°, 14.81 at 90° and 19.79 at 100°. When the air is saturated the humidity is 100; if it contains three-fourths the moisture possible at the given temperature the humidity is 75. Rains, fogs, and clouds are due to the cooling of moist air, warm air moving into cooler regions, or warm and cold air coming together and reducing the temperature below the saturation point. The mean annual rainfall is the depth of rain and melted snow in a year and in Boston is 45 inches, New York 44.8, Philadelphia 39.8, Baltimore 43.8, Washington 43.5, Charleston 56.7, Mobile 62.2, New Orleans 60.5, Louisville 45.8, Chicago 34.8, Dubuque 35.5, Oswego 35, Cincinnati 39.9, Leavenworth 38.4, Bismarck 18.4, Santa Fe 14.2, Fort Grant, Ariz. 16.5, Sacramento 20.9, Portland, Ore., 46.8, Cheyenne 12.2, London 25, Paris 71, Berlin 24, Vienna 19, St. Petersburg 17, Valdivia 106, Vera Cruz 180, San Domingo 108, Maranham 277, Hong Kong 101, Port Said 2, Astrakhan 6, Cherrapongee in Assam, 610 inches. See HUMIDITY and HYGROMETRY.

Rainbow. Optical phenomenon consisting of an arch of concentric colored bands, arranged in prismatic order, red being on the outside. It occurs when the sun or moon, not far above the horizon, throws its beams upon a sheet of falling

drops on the opposite side of the heavens. A secondary bow is sometimes seen, in which the order of the colors is reversed.

Rainey's Corpuscles. See SPOROZOA.

Rain Gauge. Funnel-shaped dish, having a graduated small cylinder below it, whereby the depth of the rainfall during a shower can be measured. It should be placed near the level of the ground in a location unobstructed by trees.



Rain Gauge.

Rainier, MT., or TACOMA. An extinct volcano in the Cascade Range of Washington. Elevation 14,444 feet.

Rains, GEORGE WASHINGTON, b. 1817. Brigadier-gen. C.S.A.; founder of Confederate powder works at Augusta, Ga.; prof. Univ. Ga. 1867; improver of portable steam engines. *Chemistry*, 1872; *Qualitative Analysis*, 1879.—His brother, GABRIEL JAMES, 1803–1881, was distinguished in the Seminole, Mexican, and Civil wars, especially (as brig.-gen. C.S.A.) at Fair Oaks.

Rainsford, WILLIAM STEPHEN, D.D., b. 1850 in Ireland. Rector of St. George's, New York, since 1883; prominent in reforms and charities.

Rain Tree. Plant of Peru, which, according to Rotolf, condenses the atmospheric moisture so freely as to produce a swampy ground beneath its shade.

Rainy Lake. Between Minnesota and Ontario; connected with Lake of the Woods by Rainy River. Area 146 sq. m.

Raisin River. In s.e. Mich.; scene of a massacre of Ky. forces by Indians, Jan. 22, 1813.

Raisins. Dried grapes, deriving their names from the place where they grow, as Smyrnas, Valencias, etc.; or from the species of grape, as muscatels, blooms, and sultanas. The finest are cured by cutting the stalk half through, when the grapes are nearly ripe, and allowing them to dry on the vine; or when fully ripe, by dipping them in a lye made from the ashes of the burned tendrils, after which they are dried by the sun. Inferior sorts are often dried in ovens.

Rajah. Title of a native sovereign in India; now extended to chiefs and prominent persons.

Rajides. See RAYS.

Rajon, PAUL ADOLPHO, 1842–1888. French etcher.

Rajputana. Twenty States of n. India, under British protection. Area 132,461 sq. m.; pop., 1891, 12,089,330, of which the Rajputs, the ruling race, are less than 7 per cent.

Rake Vein. In n. England, a highly inclined fissure vein, as contrasted with pipe veins or flats.

Raking Prop. In Mining; (1) short piece of timber used to support a curb during the excavation of the sides of a shaft; (2) prop set in an inclined position to prevent the fall of a loose roof.

Rákóczy, FRANCIS LEOPOLD, 1676–1735. Prince of Transylvania; head of an insurrection against Austria. The independence of Hungary was proclaimed May 31, 1707, but overthrown 1708–11.

Rakoczy March. National air of Hungary and Transylvania. The composer is not known. It is named in honor of Francis Rakoczy II.

Rale. Sound observed in ausculting the lungs in certain diseased conditions. It is formed by the breaking of the air through fluid in the air passages.

Raleigh. Capital of N. C., in Wake co., on the Neuse. Pop., 1890, 12,678.

Raleigh, SIR WALTER, 1552–1618. Leader of the expedition which discovered Virginia 1585; prominently connected with the defeat of the Spanish Armada 1588; organizer of an expedition to S. America for the discovery of Eldorado 1595; imprisoned and condemned to death 1603 by James I.; during his imprisonment in the Tower he wrote a *History of the World* and some poetical pieces; released 1616 and permitted to make an expedition to Guiana, 1617, which proved a failure; foully executed, nominally on the sentence passed 16 years before. His brilliant abilities and chivalrous character made him one

Sir Walter Raleigh.

of the chief adornments of that great age. *Works*, 8 vols., 1829.

Rallidæ (RAILS). Family of Grallatores, having characters intermediate between Natatores and Gallinacei. There are four elongated toes; the wings are small, the beak, neck, and legs not long. See RAILS.

Ralph, JAMES, ab.1696–1762. American versifier, in England from 1724; lampooned by Pope in the *Dunciad*.

Ralph, JULIAN, b. 1852. American magazinist, traveler, and author. *Our Great West*, 1894; *Dixie*, 1895; *People we Pass*, 1895; *Alone in China*, 1896.

Ralston, WILLIAM C., 1826–1875. Pres. Bank of Cal.; active in the development of San Francisco and the Pacific Coast; ruined by a combination against him.

Ralston, WILLIAM SHODDEN, 1828–1889. English author. *Kriloff and His Fables*, 1869; *Russian Folk-Tales*, 1873.

Ram. Ironclad vessel, armed at the prow, below the water line, with a sharp, heavy, steel beak, with a sloping edge on the upper side. This is of the strongest formation and built as an independent adjunct of the ship for the purpose of attack.

Ramadan, or RAMAZAN. Mohammedan 9th month, during which the strictest fasting is obligatory in daylight.

Ramah. 1. Town of Benjamin, 5 m. n. of Jerusalem; identified 1838. 2. Home of the prophet Samuel; in Ephraim, not located.

Ramases. See RAMESES.

Ramayana. Oldest of the Sanskrit epic poems, written by the sage Valmiki; attributed to the 5th century B.C. It celebrates the life and exploits of Rama, and his wife Sita, and the rape of the latter by Ravana, the demon king of Ceylon. The story closes with her death and vindication and Rama's translation to heaven.

Rambach, JOHANN JAKOB, D.D., 1693–1735. German hymnist; prof. Halle 1723–31, and Giessen from 1731.

Rambler, 1750–52. Periodical founded and mainly written by Dr. Johnson. It consisted of short essays on topics of the times, moral subjects, and follies of the day, after the manner of the *Spectator*.

Rambouillet, CATHERINE DE VIVONNE, MARQUISE DE, 1588–1665. Founder of a salon which long included the best brains and accomplishments of Paris.

Rameau, JEAN PHILIPPE, 1683–1764. French musician, founder of the science of harmony, organist and composer. *Traité de l'harmonie*, 1721, was approved by the Academy 1737. Louis XV. created the post of *Compositeur de Cabinet* for him. He composed over 30 operas, several cantatas, motets, and clavichord pieces.

Raments. Thin scales borne on the leaves and petioles of certain plants, especially ferns.

Rameses, or RAMSES. Thirteen Egyptian kings of the 19th and 20th dynasties. The second (Sesostris) built temples throughout his empire, the Ramesseum opposite Karnak among them, intended for the worship of his manes; fought in Nubia and Libya, conquered the Hittites, and reigned 66

years. The third had a brilliant reign; waged war with the Libyans and Hittites, and received tribute from Punt and Ethiopia. He is supposed to be the Pharaoh of the Exodus. The mummies of Rameses I., II., and III. were discovered 1881, and are now at the Gizeh Museum.

Ramie. *Bœhmeria nivea.* Herb of the natural family *Urticaceæ*, native of Asia; widely cultivated in tropical countries for its valuable fiber, known also as China grass and rhea and used for making rope, cordage and grass-cloth.

Ramie (*Bœmeria nivea*).

Ramification. System of branching of a plant or animal.

Ramillies. Village of Belgium; scene of a brilliant victory of Marlborough, May 23, 1706, over the French, who were thereby driven out of the Low Countries.

Ramirez, ALEJANDRO, 1777–1821. Spanish official in Guatemala and Cuba, eminent for financial and other reforms, and for beneficent foundations.

Ramirez, IGNACIO, 1818–1879. Mexican poet and scholar, of native descent; Minister of Justice 1860–61; banished 1865; Judge of the Supreme Court from 1867; imprisoned 1876.

Rammelsberg, KARL FRIEDRICH, b. 1813. German scientist; a leading investigator of the chemical nature and relations of minerals. *Handwörterbuch des chemischen Theils der Mineralogie*, 1841; *Handbuch der Mineralchemie*, 1860; *Handbuch der krystallographisch-physikalischen Chemie*, 1881.

Rammelsbergite. $NiAs_2$. Rare mineral, containing nickel and arsenic, found in Saxony associated with other minerals containing nickel and cobalt.

Rammohun Roy, 1772–1833. Bengalese reformer, founder of the Brahmo Somaj 1828; in England from 1831. He opposed idolatry and suttee, tr. the *Vedanta*, 1816, and pub. *Precepts of Jesus*, 1820.

Ramnes. See ROME.

Ramose. Branching plants, especially if the number of branches is large.

Ramoth Gilead. Amorite town, made a city of refuge and held by Levites; identified with Es-Salt, e. of the Jordan. Pop. ab. 4,000.

Rampant Arch. One whose abutments are not on the same level.

Ramsay, ALLAN, 1686–1758. Scottish poet. *The Gentle Shepherd*, 1725. His *Evergreen*, 1724, and *Tea-Table Miscellany*, 4 vols., 1724–40, were collections of old songs and ballads.—His son, ALLAN, 1713–1784, was a portrait painter of repute.

Ramsay, SIR ANDREW CROMBIE, 1814–1891. Prof. Univ. Coll., London, 1848; director of the geological survey of Great Britain 1872; knighted 1881; advocate of the theory that many lake basins have been eroded by glacier ice. *Physical Geology*, 1863.

Ramsay, DAVID, M.D., 1749–1815. Historian of the American Revolution, 1785–89, of S. C., 1809, and of the U. S., 1816–17.

Ramsay, EDWARD BANNERMAN BURNETT, LL.D., 1793–1872. Dean of Edinburgh 1846. He declined three bishoprics, and pub. several books, chief of which is *Scottish Life and Character*, 1856–61.

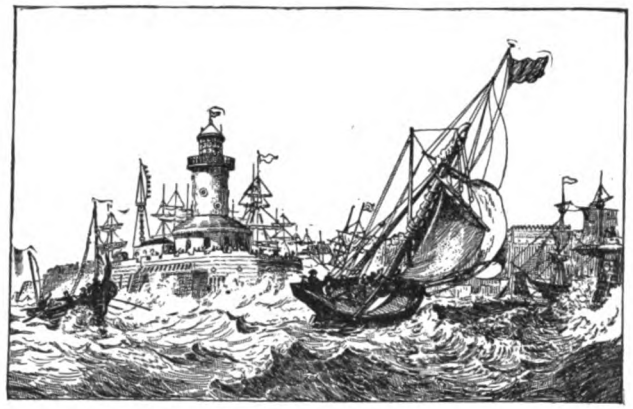
Ramsay, WILLIAM MITCHELL, D.C.L., b. 1851. Prof. Aberdeen 1886. *St. Paul's Travels*, 1895.

Ramsden, JESSE, 1735–1800. English maker of telescopes and astronomical instruments.

Ramses. See RAMESES.

Ramsey, ALEXANDER, b. 1815. Gov. of Minn. 1849–53 and 1860–63; U. S. Senator 1863–75; Sec. of War 1879–81.

Ramsgate. Seaport on e. coast of the Isle of Thanet in England, 72 m. s.e. of London. It is a harbor of refuge and



Entrance to Ramsgate Harbor.

steam packet station, and does considerable trade in coal and fish. It is a fashionable watering place. Its harbor covers 47 acres. Pop., 1891, 24,700.

Ramus, PETRUS (or **Ramée,** PIERRE DE LA), 1515–1572. French humanist, prof. at Paris 1551. His book attacking scholasticism and the Aristotelian logic, 1543, caused much wrath and the suspension of his lectures for some years. He wrote luminously on mathematics, language, theology, philosophy, and ethics, became a Protestant ab. 1562, and was one of the most illustrious victims of the massacre of St. Bartholomew.

Rana. See OXYDACTYLIA and RANIDÆ.

Rancagua. Town of Chili, 43 m. s. of Santiago. Here Gen. O'Higgins was besieged by Spanish troops, and defeated Oct. 1–2, 1814. Pop. ab. 8,000.

Rancé, ARMAND JEAN LE BOUTHILLIER DE, 1626–1700. Abbot of La Trappe 1662, author of its severe discipline, of a work thereon, in 4 vols., 1696, of *Monastic Life*, 1683, and other books. See TRAPPISTS.

Rancidity of Fats. This is due to the absorption of oxygen and the decomposition of mucilaginous and albuminous substances, which in decaying react on the fat, setting free fatty acids and decomposing the glycerin. The exciting cause is probably bacteria. It may be removed by melting the fat, washing it with hot water, and then with a weak, cold solution of sodium hydroxide.

Rancor. Fixed hatred which by its inward working has diseased the mind.

Randall. ALEXANDER WILLIAMS, 1819–1872. Gov. of Wis. 1857–60; U. S. Minister to Italy 1861–62; Postmaster-gen. 1866–69.

Randall, HENRY STEPHENS, 1811–1876. American writer on sheep-keeping. *Practical Shepherd*, 1864.

Randall, JAMES RYDER, b. 1839. Author of the Confederate song, *My Maryland*, 1861.

Randall, ROBERT RICHARD, ab. 1740–1801. Founder of Sailors' Snug Harbor, New York, removed to Staten Is. 1833.

Randall, SAMUEL JACKSON, 1828–1890. M.C. from Pa. from 1863; Speaker 1876–81; prominent chiefly as a Protectionist.

Randolph, BEVERLEY, 1755–1797. Gov. of Va. 1788–92.

Randolph, EDMUND JENNINGS, 1753–1813. Member of Congress 1779–83, and of the convention which framed the Constitution; Gov. of Va. 1788; first U. S. Atty.-gen. 1789; Sec. of State 1794–95. Accused by Fauchet, the French Minister, he was sacrificed to public exigencies. His memory has been vindicated by M. D. Conway 1888.

Randolph, EDWARD, ab. 1620–1694. British agent in America from 1676; noted for his misrepresentations and oppressions. He procured the recall of the charter of Mass. 1684, and was imprisoned with Gov. Andros 1689.

Randolph, JOHN, 1773–1833. M.C. from Va. 1799–1813 and 1815–25; U. S. Senator 1825–27; Minister to Russia 1830–31. His brilliant abilities, fierce sarcasm, and strange peculiarities made him long the most prominent member of the House. He spared Clay's life in a duel 1826.

Randolph, PEYTON, 1721–1775. Va. patriot, uncle of Edmund; Atty.-gen. 1748–66; Pres. of Congress 1774 and 1775.

Randolph, THEODORE FRELINGHUYSEN, 1816–1883. Gov. of N. J. 1868–72; U. S. Senator 1875–81.—His father, JAMES FITZ, 1791–1871, was M.C. 1829–33.

Randolph, THOMAS, 1605–1635. English dramatist and lyric poet.

Randolph, THOMAS MANN, 1768–1828. M.C. 1803–7; Gov. of Va. 1819–21.—His son, THOMAS JEFFERSON, 1792–1875, was a grandson of the third President, and his biographer 1829.

Random Stone. Large angular stones used in building embankments and breakwaters.

Random Work. Rough masonry not laid in courses. Random coursed work applies to stones brought to horizontal beds, but of unequal height.

Ranelagh. Hall at Chelsea, London, rival of Vauxhall as a place of amusement and resort; built 1742, demolished 1803–4.

Rangabé, ALEXANDER RHIZOS, 1810–1892. Modern Greek dramatic poet.

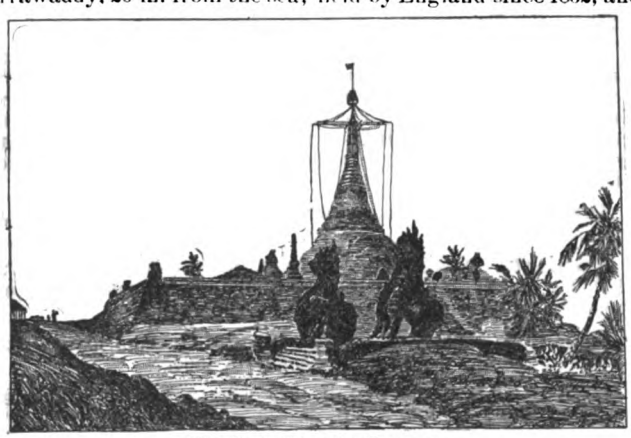
Range. In Gunnery, the horizontal distance from the muzzle to the point where the trajectory pierces the horizontal plane passing through the muzzle of the gun: it varies with the elevation, the initial velocity, resistance of the air, character of the projectile, etc.

Range Finders. Instruments by which the distance of a target from the gun may be readily determined: based on the trigonometric relations of the circular functions of the angles of a triangle to the length of its sides. In those with fixed angles and variable bases, the latter are taken in some simple ratio, such as $\frac{1}{20}$, $\frac{1}{40}$, etc., of the range: thus angles of 88° 34′ at the base correspond to bases $\frac{1}{40}$ of the range. With fixed bases and variable angles, the angles must be so carefully read as to require the use of a telescope. Fiske's Range and Position finder employs a galvanometer and Wheatstone's bridge to find the angle at the target for a fixed base.

Range (or RUN) **of Points.** Figure made up of points on a straight line, the base of the range. A range joined by straight lines with any point without the base forms a pencil. A transversal cutting a flat pencil forms a range.

Rangifer. See DEER and REINDEER.

Rangoon. City of British Burmah, in the Delta of the Irrawaddy, 20 m. from the sea; held by England since 1852, and



The Signal Pagoda, Rangoon.

of commercial importance. It ranks third among the seaports of British India, having two-thirds of the exports and nearly all the imports. Pop., 1891, 180,324.

Ranidæ. Family of anurous *Amphibia*, *i.e.* Frogs, including 248 species, the majority of which are East Indian. Of these forms some burrow, others are arboreal, like the Tree Toads (Tree-frogs). One species has expanded webs on hands and feet, which act as parachutes when it takes flying leaps; others have opposable fingers for grasping twigs. The genus *Rana* is represented by 110 species. *R. catesbiana*, the Bullfrog, is largest, approaching 8 in. in length. It is noted for its bellowing voice, but as a rule the frogs are not so noisy as are the *Hylidæ*. *R. temporaria* lives in dry woods, seeking the water only to spawn.

Ranjit Singh, 1780–1839. Sikh chieftain, founder of the Punjab kingdom; owner of the Kohinoor diamond which was presented to Queen Victoria 1850, on the confiscation of the property of the state.

Rank. In Botany, vertical row of leaves.

Rank, BREVET. Rank conferred upon an officer, by a commission giving him a grade in the army additional to and higher than that which he holds by virtue of his commission in a particular corps of the legally established military organization. He thus becomes eligible for assignment by the President to the rank which it confers: without such assignment it has no effect on the officer's status.

Rank, MILITARY. In U. S. army the grades are: 1, major-gen.; 2, brig.-gen.; 3, colonel; 4, lieut.-colonel; 5, major; 6, captain; 7, 1st lieutenant; 8, 2d lieut.; 9, cadet; 10, sergeant-major (regimental); 11, quartermaster-sergeant (regimental); 12, ordnance, commissary, and post quartermaster-sergeant, hospital steward, first-class sergeant of the signal corps, chief musician, principal musician, chief trumpeter, and saddler-sergeant; 13, first sergeant; 14, sergeant and acting hospital steward; 15, corporal. In each grade date of commission, appointment, or warrant, determines the order of precedence.

Ranke, JOHANNES, b. 1836. Prof. Munich; writer on anthropology.

Ranke, LEOPOLD VON, 1795–1886. Prof. Berlin 1825–72; historiographer of Prussia 1841; ennobled 1865. *Popes of Rome*, 1834–37, tr. 1840; *Germany in the Reformation*, 6 vols., 1839–47; *House of Brandenburg*, 1847–48; *Hist. England*, 6 vols., 1859–67, tr. 1875. His works to 1868 were collected in 47 vols.; his *Weltgeschichte*, 9 vols., 1881–88, occupied his later years.

Rankine, WILLIAM JOHN MACQUORN, 1820–1872. Scientist and civil engineer; prof. Glasgow 1855. *Applied Mechanics*, 1868; *Civil Engineering*, 1862–65; *Machinery and Mill Work*, 1869–83.

Rank of Motives. Their relation in the order of their comparative excellence or ethical value.

Ransom. In early English law, pecuniary fine in lieu of bodily punishment; in international law, payment to secure the surrender of military captives or of captured vessels.

Ransom, GEORGE MARCELLUS, U.S.N., b. 1820. Commander 1863, Captain 1870, Commodore 1877; engaged on the Gulf 1862, and on the Atlantic coast 1863–64.

Ransom, MATTHEW WHITAKER, b. 1826. Brig.-gen. C.S.A. 1863; U. S. Senator from N. C. 1872–95; Minister to Mexico 1895.

Ransom, ROBERT, 1829–1892. Brig.-gen. C.S.A. 1862; Major-gen. 1863; engineer on U. S. rivers and harbors from 1878.

Ransom, THOMAS EDWARD GREENFIELD, 1834–1864. Brig.-gen. U.S.A. 1862; distinguished in the West, as at Forts Henry and Donelson.—His father, TRUMAN BISHOP, 1802–1847, pres. of Norwich Univ., Vt., was killed at Chapultepec.

Ransom of Prisoners. Soldiers captured during war are now regarded as prisoners of the government of the belligerent that captures them and are exchanged by cartel or agreement determined upon by the belligerents: formerly, in feudal times and among barbarous peoples they were considered the property of the captors and were released upon the payment of ransom.

Ranstead-Weed. See BUTTER-AND-EGGS.

Ranters. 1. Anabaptist sect in England ab. 1645; Antinomians in theory and practice; short-lived. 2. Primitive Methodists.

Rantoul, ROBERT, 1805–1852. U. S. District-attorney for Mass. 1845–49; M. C. 1851; active in the anti-slavery cause and other reforms, as was his father, ROBERT, 1778–1858.

Ranunculaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 45 genera and 750 species, widely distributed throughout all parts of the earth; called the Buttercup or Crowfoot family.

Ranunculus asiaticus, garden varieties.

Ranvier, LOUIS, b. 1835. Prof. Coll. de France; writer on histology.

Ranz des Vaches. Melodies of the Swiss Alps, played by herdsmen on the keep-horn; painfully effective when heard by natives in exile.

Rapacia. See POLYPROTODONTIA.

Rapateaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 6 genera and ab. 20 species, natives of Brazil and Guiana.

Rape. *Brassica napus.* Herb of the Mustard family, native of Europe; extensively cultivated for its seeds, from which Rape-seed Oil is expressed. *Brassica campestris,* another variety, is largely grown in Europe as a forage crop and for soiling purposes. An oil is extracted from the seed and the refuse cake makes an excellent nitrogenous cattle food. Rape has only recently been introduced into the U. S., and is still comparatively little known. It is sown late in summer as a late autumn or early winter soiling crop.

Rape. Carnal knowledge of a woman forcibly and against her will: more minutely defined by modern statutes, which also prescribe various punishments.

Raphael. Archangel, celebrated in the apocryphal book of Tobit.

Raphael (RAFFAELLE SANTI), 1483–1520. Italian painter, b. at Urbino, active at Perugia, Florence, and after 1508 at Rome. In oil paintings his manners or styles are therefore distinguished as Peruginesque, Florentine, and Roman, according to this sequence of time and local influence. His greatest works are the wall paintings in the Vatican, partly in the room known as the Stanze, and partly on the ceiling of a corridor known as the Loggie. The cartoons for tapestries, subjects from the lives of the apostles, are now in the South Kensington Museum at London. The tapestries themselves were intended for and long hung in the Sistine Chapel. There are ten of these tapestries and seven surviving cartoons. A duplicate set of the tapestries is mainly in the Berlin Museum, where they decorate the upper part of the great rotunda. In the Farnesian Villa at Rome is a series of frescoes from the story of Cupid and Psyche, from designs by R., done by scholars. The *Galatea* of this villa is his original work. His oil paintings are numerous, especially the Madonnas. The greatest of these is the *Sistine* in Dresden. Otherwise may be quoted especially the *St. Cecilia* in Bologna and the *Betrothal of Mary and Joseph* in Milan. All of R.'s pictures are distinguished by a symmetry of balance and arrangement in line effect in which he stands quite alone among modern painters. He was by turns, according to his age, first, ingenuous and simple, then sprightly and vivacious, finally powerful and thought-stirring, but always industrious, successful, and happy.

Raphael

Raphall, MORRIS JACOB, Ph.D., 1798–1868. Rabbi, b. in Sweden, long in England; in New York from 1849; tr. *Mishna,* 1840, with D. A. de Sola. *Post-Biblical History of the Jews,* 1855.

Raphe, or RHAPHE. Ridge along the side of the anatropous or amphitropous ovule; also this structure in the seed; also the median rib connecting the nodules of a diatom frustule.

Raphideæ. Order of *Diatomaceæ,* comprising the genera which have a well-defined raphe, or median rib connecting the nodules.

Raphides. Needle-like crystals occurring in the parenchyma of certain plants; generally composed of oxalate of lime, and especially abundant in plants of the natural orders *Araceæ* and *Onagraceæ.*

Raphidian. In Plant Anatomy, cells containing raphides.

Rapidan. River of Va., flowing e. to the Rappahannock ab. 10 m. above Fredericksburg, ab. 80 m. long.

Rapid-Fire Guns. The necessity of preventing torpedo boats from coming within effective range to destroy battleships brought about the development of the rapid-fire gun. It consists of a single barreled breech-loading rifle capable of being trained quickly and kept easily upon a swiftly moving object, and of firing with great accuracy a large number of projectiles in a very short time. The rapidity of fire results from the quickness with which the different operations of loading and laying the gun can be performed. The use of fixed ammunition in metallic cases shortens the time of loading and saves that of inserting the primer. In the recoil mounts the gun returns automatically to the firing position and in the non-recoil carriage no time is lost, the gun always remaining in the firing position. The intervals of time between firings is diminished to the least possible by the rapidity with which the gunner operates the handle bar for opening and closing the breech, the cocking of the hammer taking place also during the latter operation. Since their first invention in 1880 they have increased rapidly in size, range, and destructive power. The use of smokeless powder in the cartridge has enormously increased the initial velocity, as shown by the Armstrong 6-in., which, in Jan. 1893, gave 3,711 f. s. to a 70 lb. shot, and this has brought about a corresponding increase in the thickness of the protective armor of torpedo vessels. These guns are named from their designers and from the weight of the projectile or diameter of the bore in inches or millimeters. They comprise two classes; first, those whose breech mechanism consists of a wedge-shaped breech block, and, second, those having an interrupted-screw breech block. The principal types of the former are the Hotchkiss, Nordenfelt, Gruson, Krupp, and Driggs-Schroeder, and of the latter are the Canét, Schneider, Seabury, Dashiell and Gordon. The following data of the 6-in. Driggs-Schroeder, tested by the Ordnance Board at Sandy Hook proving grounds in June 1894, will serve as an example of the capacity of the modern rapid-fire gun. Weight 786 lbs.: caliber 2.244 in.: length 50 calibers: weight of breech mechanism 35¼ lbs.: number of rounds fired in one minute 32: time of firing 100 rounds 275⅜ seconds: mean initial velocity 1,891 f. s. Hotchkiss and Nordenfelt monopolized the construction of these guns until ab. 1885, but since that time more than eighteen firms were engaged in their manufacture. Of the Hotchkiss, there are 21 types, varying from 37 mm. or 1-pdr. caliber to the 155 mm. or 100-pdr. caliber. The armament of a modern battleship would be ten 100-pdrs., sixteen 6-pdrs., eight 3-pdrs., with a capacity of seven, twelve, and twelve rounds respectively per gun per minute. Rapid-fire guns will probably hereafter have a wider field of usefulness on land for the protection of stationary torpedo lines and in the defense of fortified places. See HOTCHKISS GUNS.

Rapier. Word of Spanish origin, signifying a gentleman's sword; a light, thrusting weapon, about three feet long, worn on occasions of court ceremonials.

Rapin de Thoyras, PAUL DE, 1661–1725. French Protestant, resident mostly in Holland and w. Prussia. His *History of England,* 8 vols., 1724, tr. in 15 vols., 1725–31, was considered by Voltaire the best then extant. It was enlarged 1749 and later.

Rapp, GEORGE, 1770–1847. German-American founder of the Harmonists or Rappists, and of settlements at Harmony, Pa., 1803, New Harmony, Ind., 1815, and Economy, Beaver co., Pa., 1824.

Rapp, JEAN, 1772–1821. French general 1805, Count 1809; distinguished at Austerlitz and in the defense of Dantzig; prisoner in Russia 1813–14; Peer of France 1819. *Memoires,* 1823.

Rappahannock. River of Va., rising near the Blue Ridge, and navigable from Fredericksburg; length ab. 250 m. Several battles were fought on it and its tributary, the Rapidan, during the Civil War.

Rapparees. In 17th and 18th centuries in Ireland, ejected tenants, who waged a sort of guerrilla warfare on their successors.

Rappee. Strong snuff, made from the darker and ranker tobacco leaves, or from the veins and fibers.

Rappen. Smallest coin of the Swiss cantons, worth ab. a centime or fifth of a cent.

Raptatores (RAPTORES, ÆTOMORPHÆ, ACCIPITRES). Birds of Prey. Order of *Insessores,* including powerfully built birds,

with curved beak hooked at the point, and feet strongly clawed (*Insidentes*). The outer toe can be turned backward or forward. The legs are rarely feathered below the intertarsal joint. They feed principally on warm-blooded animals. The young are altrices, and number ab. four to a nest, which is usually placed in inaccessible places. The male is more powerful than the female. The latter incubates the eggs, but the male assists in procuring food. There are three subgroups: STRIGES, PANDIONES and FALCONES (q.v.).

Rarey, JOHN S., 1828–1866. American horse-tamer, prominent as an exhibitor from 1856; in Europe 1860–61. *Horse-Taming*, 1858.

Raritan. River of e. N. J., navigable from New Brunswick to its mouth at Perth Amboy.

Rash. Eruption of the skin accompanying the eruptive fevers, *e.g.*, scarlet fever, measles; or resembling the eruptions of such fevers.

Rashi (RABBI SHELOMOH BEN IZAAKI). 1040–1105. Greatest of Jewish commentators. He lived at Troyes, s. France, and elucidated all the O. T. books except Chronicles. His work on the Pentateuch was the first book printed in Hebrew, 1574. It was tr. into German 1833–38, and the whole into Latin 1710–14.

Rask, RASMUS CHRISTIAN. 1787–1832. Danish philologist, prof. Copenhagen 1825. He traveled through Russia, Persia, and India, 1819–23, and brought back many MSS. His works on *Icelandic Language*, 1808–18, *Danish Orthography*, 1826, and edition of the *Eddas*, 1818, are highly valued. Among his other works are grammars of Anglo-Saxon, 1817, tr. 1830, Spanish, Frisian, and Italian. He partly anticipated GRIMM'S LAW (q.v.).

Raskolniks. Russian schismatics, who adhere to the old ritual and reject all reforms or alterations; extant since ab. 1666, and from an early period in two sects, one practically Congregationalists or Presbyterians. They are numerous, and of high character.

Rasle, SEBASTIEN, 1658–1724. French missionary in Maine from 1695. His Abenaki dictionary was pub. 1833.

Rasores. Order of birds, including the *Gallinacei* or *Gallinæ;* scratching birds, of which the domestic fowl is a type. Some authors also include the *Columbinæ*, and even the *Crypturi*.

Raspail, FRANÇOIS VINCENT. 1794–1878. French surgeon, introducer 1845 of a camphor system of antiseptic surgery.

Raspberry. Shrubs of the genus *Rubus*, natural family *Rosaceæ*, natives of Europe and N. America, bearing delicious edible aggregate fruits consisting of numerous small drupes borne on an elongated receptacle. The Black Raspberry or Thimbleberry of e. N. America is *R. occidentalis*.

Raspberry (*Rubus idæus*).

Raspe, HENRY, d. 1247. Landgrave of Thuringia; proclaimed emperor of Germany by the Rhenish archbishops 1246; defeated by the regent Conrad.

Rassam, HORMUZD, b. 1826. Mesopotamian Assyriologist, helper and successor of Layard in explorations; envoy to Abyssinia, and prisoner there 1866–68; discoverer of sites and relics for the British Museum. *Mission to Theodore*, 1869.

Rastadt, or RASTATT. Town of Baden, strongest fortress since 1848. Here was signed the treaty which ended the war of the Spanish succession 1714; here met the Congress which aimed to settle the differences between France and the Empire 1797–99.

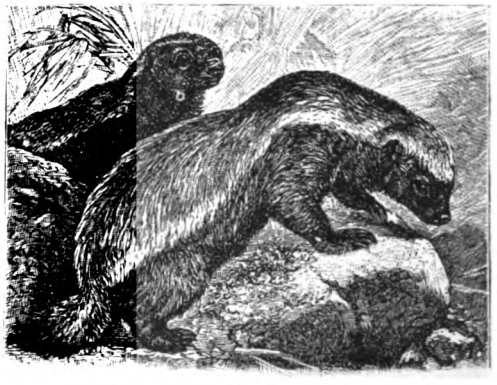
Rastell, WILLIAM, 1508–1565. English writer on law. *Statutes*, 1594; *Collection of Entries*, 1596.

Rat. See RATS.

Ratafia. French cordial composed of alcohol, sugar and a flavoring substance, fruit or berry juice, kernels and flowers; as almonds, cherries, raspberries, coffee, orange blossoms, etc.

Ratchet Wheel. Form of toothed wheel, whose teeth are designed not so much to transmit motion to another wheel, as to fit them to resist the impact of the pawl or dog which opposes motion in one direction. The pawl is a lever, usually curved, and pivoted at one end. It is so mounted with respect to the wheel that when gravity or a spring shall cause it to fall into the space between two teeth, pressure against the end of the pawl is transmitted to the pin on which it is pivoted, and rotation of the wheel in that direction is prevented. When the wheel is turned the other way, the under side of the pawl is lifted by the slope of the ratchet teeth, and the pawl clicks harmlessly as it passes over the crests. Conversely, the wheel may be driven by the pawl. The back of the ratchet tooth is therefore usually a sloping curve, and the front a straight face, the normal to the latter at the common contact of tooth and dog passing outside the pivot in pulling dogs and between the centers of ratchet and dog for pushing and holding ones. The pawl and half pawl arrangement on a ratchet wheel secures less fall-back where the teeth are large. It is used on winding machinery to hold the strain of weight or spring, and on hoisting machinery, such as derricks, cranes, and capstans, to retain the load.

Ratel (HONEY BADGER). Burrowing, skunk-like animal, 2 ft. long besides the short tail, with anal glands that eject a



Cape Ratel (*Mellivora ratel*).

pungent liquid; black on the sides and gray along the back. One species is Indian, two are tropical African. They are skillful bee-hunters.

Rate of a Clock. Amount which the clock gains or loses in a given time, usually a day.

Rates, METHOD OF. Advanced by some as the basis of the differential calculus. The differential of a variable at any value is defined as the measure of its rate of change at that value: the differential of the function is the measure of its simultaneous rate of change. The first differential coefficient is the ratio of the rate of change of the function to that of its variable.

Ratich, WOLFGANG, 1571–1635. Educationist, whose system of education, based on Bacon's philosophy, he put into practice in Germany, at Köthen, 1618, and at Magdeburg, 1620, without success.

Ratification. Adoption by one of an unauthorized act done on his behalf by another. It must be made with a knowledge of all material circumstances, or with intent to take the consequences without knowledge. It has the legal effect, generally, of a precedent authority to do the act.

Ratio. Measure of the comparison of two magnitudes. Arithmetical ratio gives the difference, geometrical ratio the quotient: the latter is the general meaning. The terms of a geometrical ratio are antecedent and consequent; it is indicated by two dots (:) or by the fractional form.

Ratiocination. Process of reasoning, usually limited to syllogistic method, in which the proof of a proposition is effected by two premises and a middle term; a process of determining knowledge which is mediate, and contrasted with the immediate act of intuition and experience.

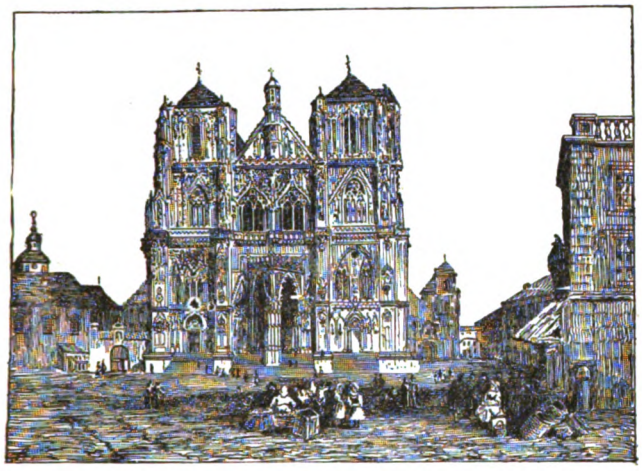
Ration. In U. S. Army, the ration is allowance for subsistence of one person per day and consists of meat, flour, vegetables, coffee and sugar, the seasoning, and soap and candle; its value is estimated at 18 cts. When troops travel otherwise than by marching, or when they are separated from cooking facilities, and do not carry cooked rations, the travel ration is issued, consisting of bread, canned beef and baked beans, roasted coffee and sugar; this ration is valued at 40 cts.

Rationalism. Doctrine denoting the dependence upon internal functions, the reason of the subject, for the determination of truth. It opposes all forms of external authority for the validity of belief and knowledge. In philosophy, it is opposed to sensationalism, which has denied the contributing agency of Reason to the products of knowledge. In theology, it substitutes Reason for authority as arbiter in matters of faith. It has existed in every age, but chiefly since the Reformation, when Socinus and Zwingli were its chief exponents; opposed to a formal and traditional orthodoxy, from which it is a reaction. The word was used by Comenius 1661, and from ab.1750 was applied especially to a series of professors, whose cool and dry views were long prevalent in Germany. It has only recently emerged from the disrepute of this narrow use, and come to mean a tendency or ruling idea rather than a system of doctrines. The history of rationalism has been traced by several writers, eminently by W. E. H. Lecky, 1865.

Rational Psychology. Branch of philosophy which concerns itself with the nature of conscious activity or of mind, and related questions. It is thus contrasted with modern empirical psychology, which concerns itself solely with the accurate description of the observable phenomena of consciousness and the inference of the laws which underlie them, by scientific methods. See PSYCHOLOGY.

Rational Quantity. One having, in its simplest form, only integral exponents; opposed to irrational.

Ratisbon, or REGENSBURG. Town of Bavaria; frontier fortress of the Romans; free imperial city 1245; taken by the Swedish-German forces 1633; scene of severe fighting between



Cathedral in Ratisbon.

Napoleon and Archduke Charles April 19–23, 1809; ceded to Bavaria 1810. A Catholic league was formed here, July 6, 1524, to enforce the edict of Worms. Pop., 1890, 37,635.

Ratisbon, CONFERENCE OF. April 27 to May 25, 1541, between 3 Lutherans and 3 R. Catholics, Melanchthon and Eck the most eminent. They came to agreement as to justification by faith and on nothing else.

Ratitæ. Sub-class of *Aves*, characterized as having no keel to the sternum, no firm rectrices or remiges; the wings are more or less rudimentary, the birds being cursorial and incapable of flight. The orders included are CURSORES, APTERYGIA, and DINORNITHIDÆ (q.v.).

Ratlines. Small ropes attached to the shrouds, forming the steps of a ladder by which sailors go aloft.

Ratramnus (miscalled BERTRAM), d. after 868. Monk of Corbie, n. France. He refuted the transubstantiation doctrine of his abbot, Radbert, in a tract of the same title, *On Christ's Body and Blood*, tr. 1549 and often reprinted. Its genuineness was denied by the Council of Trent.

Rats. Largest species of genus *Mus*. The common brown rat, improperly called Norway rat, came originally from Asia, entering Europe 1727. It has overrun Europe and the New World, driving out the black rat. The latter was introduced into America 1544, but is now rare. Feral rats live in burrows. The wood rat (*Neotomus*) has hairy tail and sole of foot, with soft lustrous fur, brown above and white below. In the Rocky Mts. is an edible species with tail resembling a squirrel's. See MYOMORPHA.

Rattans. Slender stems of species of *Calamus*, a genus of Palms, native of India.

Rattazzi, URBANO, 1808–1873. Italian Minister of Justice 1853–58; Premier 1862 and 1867.

Rattle. *Rhinanthus crista-galli*. Yellow-flowered herb of the Figwort family, native of the n. temperate zone.

Rattle-Box. Yellow-flowered herbs of the genus *Crotalaria*, natural family *Leguminosæ;* of wide geographical distribution in temperate and tropical regions. When ripe, the seeds become loose in the pods and rattle when shaken.

Rattlesnake Master. See SNAKEROOT, BUTTON.

Rattlesnake-Plantain. Orchids of the genus *Peramium*, natives of the n. temperate zone, bearing small flowers and mostly striped or mottled leaves.

Rattlesnake-Root. Coarse herbs of the genus *Prenanthes*, natural family *Compositæ*, natives of N. America. *P. alba* is known also as White Lettuce.

Rattlesnakes. There are fifteen species of *Crotalus*, with true rattles on the tail. These are rings of epidermis loosely jointed together, so as to make a rattling noise, which can be imitated by several harmless snakes by vibration of the tail amid dry leaves. The animal uses these organs to warn enemies of its presence, that they may flee and the snake not be endangered. All rattlesnakes are more or less sluggish, and assume the defensive rather than the offensive attitude. *C.*

Rattlesnake (*Crotalus durissus*).

horridus, the species most common in the e. U. S., is now restricted to mountain regions remote from habitations. It lives on rats and squirrels or rabbits. The largest rarely exceed four feet, and have twenty-three rattles. It is marked by lozenge-shaped bands. *C. lucifer*, the Western Rattler, has large dorsal markings with dark margins; the ground color is reddish brown. The Prairie Rattler (*C. confluentes*) is most sluggish of all. *C. durissus* is the rattler of the Southwest and extends into S. America. It has about 30 rows of scales, with swollen keels. See COPPERHEAD and SOLENOGLYPHA.

Rattlesnake-Weed. *Hieracium venosum*. Yellow-flowered herb of the Composite family, with purple-veined leaves, native of e. N. America.

Rauch, CHRISTIAN DANIEL, 1777–1857. German sculptor, memorable for the monument of Frederick II. at Berlin, and statues of Queen Louisa, Blücher, Goethe, and others.

Rauch, FRIEDRICK AUGUST, 1806–1841. Pres. Marshall Coll., Mercersburg, Pa., 1836. *Psychology*, 1840.

Rauch, JOHN HENRY, M.D., b. 1828. Sec. Ill. Board of Health; medical writer.

Rauhe Haus. Institution founded 1831 at Horn, near Hamburg, by J. H. Wichern, for poor children; since grown to vast size and varied uses, with a training-school for teachers attached 1845.

Raumer, FRIEDRICH LUDWIG GEORG VON, 1781–1873. Prof. Breslau 1811, Berlin 1819. *The Hohenstaufens*, 6 vols., 1823–25; *Hist. Europe Since 1500*, 8 vols., 1832–50; *Recent History*, 5 vols., 1836–39. He wrote several books of travel, as *America*, 1845.—His brother, KARL GEORG VON, 1783–1865, Prof Breslau 1811, Halle 1819, and Erlangen 1827, wrote many scientific works. *Geographie*, 1832; *Geschichte der Pedagogik*, 1843–51.

Ravaillac, FRANÇOIS, 1578–1610. French fanatic, murderer of Henry IV.; executed with hideous tortures.

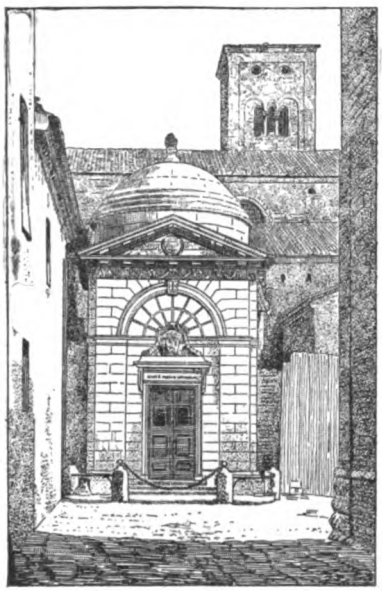
Ravel Family. French pantomimists and dancers, well known in the U. S. 1832–34 and 1837–48.

Ravelin. In Fortifications, a detached work having a parapet and ditch forming a salient angle in front of the CURTAIN (q.v.). It may be considered a REDAN (q.v.) upon the counterscarp, upon which it is erected.

Raven. Bird differing from the CROW (q.v.) by its larger size and the lanceolate feathers of its throat. It can mimic the human voice and by superstitious persons is regarded as a bird of evil omen.

Ravenel, HENRY WILLIAM, LL.D., 1814–1887. Botanist of S. C.; writer on *Fungi*.

Ravenna. City of n.e. Italy; taken by Romans 187 B.C.; capital of Western Empire 404; given by Pepin of France to Pope Stephen 754; held by Venice 1440–1509; scene of a victory of the French under Gaston de Foix over the Spanish and Papal armies, April 11, 1512 Pop. ab. 20,000; commune ab. 61,000.



Tomb of Dante at Ravenna.

Ravenscroft, THOMAS, 1592–1640. English composer, especially of psalm tunes. *Melismata*, 1611.

Ravenstein, ERNEST GEORGE, b. 1834. German-English geographer.

Ravignan, GUSTAVE FRANÇOIS XAVIER DELACROIX DE, 1795–1858. Preacher at Notre Dame, Paris, 1837–48; writer on the Jesuits, 1844. *Clement XIII. and XIV.*, 1854.

Ravinala. See TRAVELER'S TREE.

Rawal Pindi. Town of the Punjab, n. India, 160 m. n.w. of Lahore; scene of the Sikh submission 1849, and of a review held by Lord Dufferin 1885 for the Afghan Ameer. Pop., 1891, 73,460.

Rawdon-Hastings, FRANCIS, 1754–1826. Irish soldier, in America 1773–81; Baron 1783; Earl of Moira 1793; Lord-lieut. of Ireland 1805; Gov.-gen. of India 1813–23; Marquis of Hastings 1816.

Rawle, WILLIAM, 1759–1836. U. S. Dist.-attorney for Pa. 1791. *View of the Constitution*, 1825.—His son, WILLIAM, 1788–1858, pub. 25 vols. of Pa. Supreme Court Reports, 1818–33. —His son, WILLIAM HENRY, LL.D., 1823–1889, pub. *Covenants for Title*, 1852.

Rawlins, JOHN AARON, 1831–1869. Brig.-gen U. S. Vols. 1863; on Gen. Grant's staff 1861–65; Brig.-gen. U.S.A 1865; Sec. of War 1869.

Rawlinson, GEORGE, b. 1815. Prof. Oxford 1861–89; Canon of Canterbury 1872. Tr. Herodotus, 1858–60; *Five Great Monarchies*, 1862–67; *Parthia*, 1873; *Sassanian Empire*, 1876; *Ancient Egypt*, 1881; *Phœnicia*, 1889.—His brother, Sir HENRY CRESWICKE, D.C.L., 1810–1895, was long an official in India, Persia, and Turkey; knighted 1856; M.P. 1858 and 1865–68; Baronet 1891. *Hist Assyria*, 1852; *Cuneiform Inscriptions of w. Asia* (with E. Norris and G. Smith), 5 vols., 1861–70; *England and Russia in the East*, 1874.

Rawson, ALBERT LEIGHTON, LL.D., b. 1829. American traveler and Orientalist.

Rawson, GEORGE, 1807–1889. English hymnist.

Ray. Main branches of an umbel or cyme; also ligulate flowers of plants of the Composite family.

Ray. In the propagation of a wave-motion of any kind through an elastic medium, the imaginary straight line drawn at right angles to the wave-front at any point is called a ray passing through that point. A collection of parallel rays constitutes a beam.

Ray, ISAAC, M.D., LL.D., 1807–1881. Supt. Me. insane asylum 1841, and at Providence, R. I., 1845–66. *Medical Jurisprudence of Insanity*, 1838; *Mental Hygiene*, 1863.

Ray, JAMES BROWN, 1794–1848. Gov. of Ind. 1825–31.

Ray, or **Wray,** JOHN, F.R.S., 1627–1705. English botanist and zoölogist. *Historia Plantarum*, 3 vols., 1686–1704; *Synopsis Methodica Animalium*, 1693. *Memorials*, 1844–48, pub. by the Ray Society.

Ray, JOHN, 1816–1888. Reviser of the La. Code. *Digest*, 1870.

Rayahs. Peasants in Servia, Bulgaria, etc., while under

Mussulmans and Rayahs.

Turkish rule. They were treated as cattle by their Turkish masters, hence the word Rayahs, which means cattle.

Rayleigh, JOHN WILLIAM STRUTT, BARON, D.C.L., LL.D., F.R.S., b. 1842. Prof. Cambridge 1879–84, and Royal Inst., London, since 1887; discoverer, with Ramsay, of argon 1894. *Theory of Sound*, 1877–78.

Raymond VI., d. 1222. Count of Toulouse 1194; ruler of the rich territory of s. France, blighted by the Albigensian crusade; defeated by Simon de Montfort 1211 and 1213; memorable for his vacillating course under cruel persecutions.

Raymond, HENRY JARVIS, 1820–1869. Founder, 1851, and editor of N. Y. *Times*; Speaker of N. Y. Assembly 1850 and 1861; Lieut.-gov. of N. Y. 1855; one of the organizers and leaders of the Republican party; M.C. 1865–67. *Life of Lincoln*, 1865.

Raymond, HIPPOLYTE, d. 1895. French playwright.

Raymond, JOHN T. (orig. O'BRIEN), 1836–1887. American actor, best known as Mulberry Sellers in *The Gilded Age*, 1874.

Raymond, ROBERT, LORD, 1673–1733. Chief-justice of King's Bench 1727–33. *Entries on Pleadings*, 1767.

Raymond, ROSSITER WORTHINGTON, b. 1840. American mining engineer; ed. *Am. Jour. Mining*, 1867; U. S. commissioner of mining statistics 1868; pres. Am. Inst. Mining Engineers 1872.

Raymond, SIR THOMAS, 1626–1683. Justice of King's Bench 1680–83. *Reports*, 1696.

Raymond of Sabunde, d. 1437. Spanish mystic, prof. at Toulouse ab.1430. His *Theologia Naturalis*, 1436, was tr. into Latin 1487, and into French by Montaigne 1569.

Raymund Lully. See LULLY.

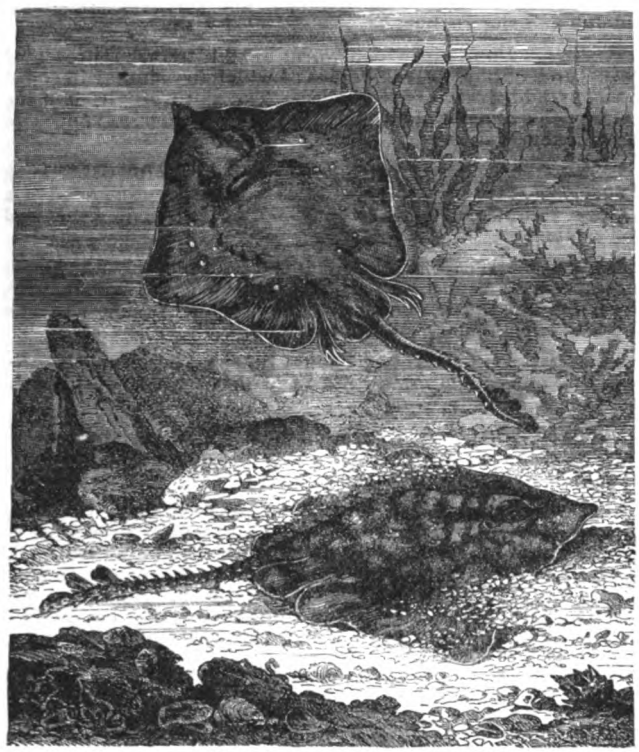
Raynal, GUILLAUME THOMAS FRANÇOIS, 1713–1796. French encyclopedist, previously a Jesuit. *Divorce of Henry VIII.*, 1763. His *Establishments of Commerce in the Two Indies*, 5 vols., 1770–80, caused his exile till 1787. *Revolution in America*, 1781.

Raynouard, FRANÇOIS JUSTE MARIE, 1761–1836. French dramatist and poet; Deputy 1791 and later. After narrowly escaping the guillotine, he entered the Academy 1807, and turned to the language and literature of his native Provence. His chief works are: *Poems of the Troubadours*, 6 vols., 1816–21; *Romance Grammars*, 1816–21; and a *Romance Dictionary*, 6 vols., 1838–44.

Rayon, IGNACIO LOPEZ, 1773–1827. Mexican patriot, prominent in resistance to the Spaniards, as was also his brother RAMON, 1775–1839.

Rays (RAJIDES, BATTIDES, BATOIDEA). Plagiostome fishes, with bodies flattened horizontally; with five gill-slits on the ventral side, internal to the pectoral fins. They have complete pectoral girdle, and cranial fin cartilages, but no anal fins. Many Rays attain a length of ten or more feet. They live on the bottom of the sea and feed principally on Crustaceans and Mollusks. The Electric Rays (*Torpedo*) have the electric organ between the fin cartilages and the gills. The Sting-Rays (*Try-*

gon) have one or more spines on the slender tail, which can be used as powerful stings. The family *Rajidæ* includes the Skates and Rays. They live in shallow water, feed on shell fish, and nearly all bring forth their young alive. The eggs are inclosed in squarish cases (sea-purses) with slender projections from each corner, as in many sharks. The Sawfish has



Rays (*Raja clavata*).

a flat snout 5 ft. long, set with numerous sharp teeth on the edges, and projecting sidewise, a powerful weapon. The *Miliobatidæ* include Sea Devils or Devil fishes: the latter name is also applied to Cephalopods. Some of these grow to a size exceeding 15 ft. in breadth, and weigh a ton. The males and females live in pairs and have only one young, which they carefully tend.

Razor-Bill. 1. *Alca torda.* Auk of n. temperate coast of the Atlantic, ranging from the Arctic seas to L. I.; noted for its laterally compressed beak. 2. *Rynchops.* Skimmer or Cut-water, of warmer Atlantic shores, occasionally n. as far as L. I. Its lower mandible is ab. an inch longer than the upper, and laterally compressed. In flight the lower mandible is held in the water, thus dipping up small fishes.

Reach. Distance between two points on the bank of a river where the current flows without interruption.

Reaction. See SUGGESTION.

Reaction, CHEMICAL. Occurring when two or more substances, brought into contact, unite or decompose to form other substances.

Reaction-Time. See PSYCHOMETRY.

Read, GEORGE, 1733–1798. Delegate to Congress 1774–77; signer of the Declaration of Independence; framer of the first constitution of Del.; member of the constitutional convention of 1787; U. S. Senator 1789–93; Chief-justice of Del. from 1793. —His brother, THOMAS, 1740–1788, was Commodore of the Pa. navy 1775, and in the Continental service 1776–77.

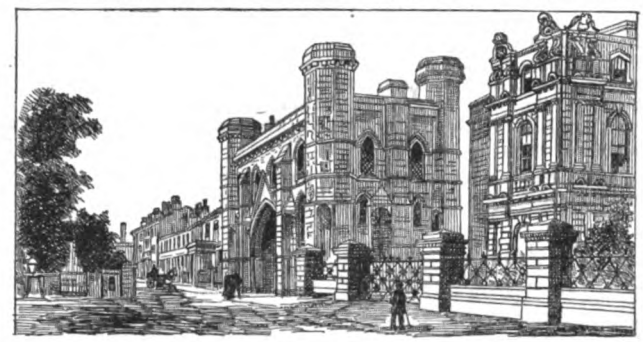
Read, JOHN MEREDITH, LL.D., 1797–1874. Grandson of George; Chief-justice of Pa. from 1860.—His son and namesake, 1837–1896, was U. S. Consul-gen. for France 1869–73, acting also for Germany 1870–72, and U. S. Minister to Greece 1873–79. *Henry Hudson*, 1866.

Read, NATHAN, 1759–1849. American inventor of a tubular boiler and high-pressure engine.

Read, THOMAS BUCHANAN, 1822–1872. American artist and poet; best known by his verses on *Sheridan's Ride*, and picture of Longfellow's daughters. *New Pastoral*, 1854; *House by the Sea*, 1856; *Sylvia*, 1857; *Wagoner of the Alleghanies*, 1862.

Reade, CHARLES, 1814–1884. English novelist and dramatist. His chief work, *The Cloister and the Hearth*, 1861, presents the 15th century with great force. *Never too late to Mend*, 1856, attacked prison abuses, and *Hard Cash*, 1863, private asylums. Others of note are *Peg Woffington*, 1852; *Christie Johnstone*, 1863; *Griffith Gaunt*, 1866; *Foul Play*, 1869; *A Woman-hater*, 1877.—His nephew, WILLIAM WINWOOD, 1839–1875, novelist and traveler, pub. *Veil of Isis*, 1861; *Savage Africa*, 1863; *Martyrdom of Man*, 1872; *Ashantee Campaign*, 1875; and *The Outcast*, 1875.

Reading. Borough of Berkshire, on the Thames at the mouth of the Kennet, 39 m. w. of London. The town has some fine buildings, especially the town hall block, with an excellent



Assize Courts, Reading.

public library and museum, the latter containing the most valuable collection of Romano-British remains in England. Pop., 1891, 55,752.

Reading. City of Berks co., Pa., on the e. bank of the Schuylkill; settled 1748, chartered 1783 and 1847; center of an iron manufacturing district. Pop., 1890, 58,661.

Reading Microscope. One arranged for reading the circles of fine astronomical and geodetic instruments.

Reagan, JOHN HENNIGER, b. 1818. M.C. from Texas 1857–61; Postmaster-gen. C.S.A. 1861–65; M.C. 1875–87; U. S. Senator 1887–93.

Real. Spanish silver coin from 1497; one-eighth of a dollar till ab. 1830; now one-twentieth.

Real Actions. Proceedings at common law for the recovery of lands: COVENANTS, those in real estate conveyances which affect the nature, quality, or mode of enjoyment of such estate: ESTATE, an estate for life or in fee in lands, tenements and hereditaments.

Real and Money Income. All the new economic goods which come to a person during any given period, less whatever he has had to part with to obtain these, make up his real income; but income frequently means only that part of the above which comes to him in the form of money.

Real Cost of Production. Sum of the exertions of all the different kinds of labor involved in making the given article, and of the abstinences required for saving the capital used in making it.

Real Estate. See REAL ACTIONS.

Realf, RICHARD, 1834–1878. Anglo-American poet.

Realgar. 1. As_2S_2. Red or orange-yellow mineral, containing sulphur and arsenic, frequently associated in small quantity with silver and lead ores, as in Hungary, Bohemia, and Saxony; also found at several localities in the w. U. S. 2. Artificial product. See ARSENIC DISULPHIDE.

Realism. Two different theories, one epistemological, the other philosophical. The former is opposed to idealism and asserts the existence of something other than mind in the world; namely, matter: the second affirms that general conceptions represent a real essence in existence, which corresponds to them, and is opposed to nominalism.

Reality. 1. Objective as opposed to subjective, real as opposed to illusory; 2. The actual, whether subjective or objective; 3. The permanent as opposed to the transient. The first contrasts it with the mental, the second includes the mental, the third makes no implications as to its metaphysical nature.

Realized Wealth. That part of a man's income which he has saved, whether in present use as capital or laid away for future use; so called as distinguished from income, in questions of taxation.

Real Presence. Doctrine variously held and defined in

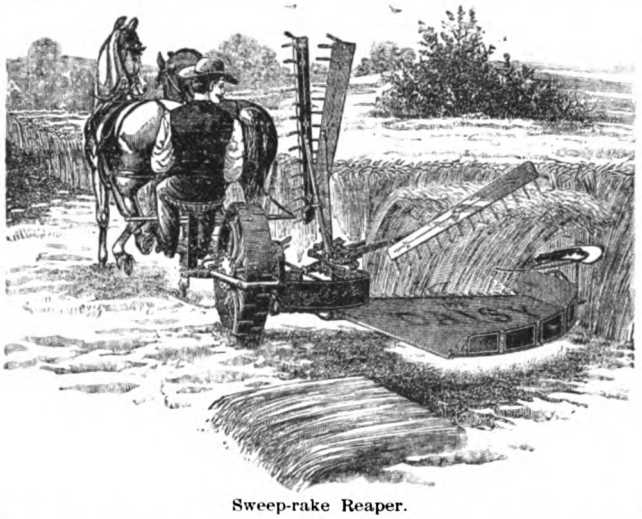
the Catholic and Lutheran Churches, that Christ is corporeally, or at least spiritually, present in the elements consecrated and administered in Holy Communion.

Real Quantity. One involving in its combination no impossible operations.

Real Wages. See NOMINAL WAGES.

Reamer. Steel tool for enlarging a hole that has been made. Taper reamers have this as their primary function, and are much used in riveted work, where the hole is made intentionally too small, so that the metal fatigued by punching may be reamed away (see PUNCH). Also where holes in a riveted seam do not come opposite, but are "half-blind," a taper reamer enlarges both holes till the rivet will pass through. The reamer also appears as a cylindrical bar into which flutes have been milled, so that the tool, when introduced into an untrue hole, will cut it cylindrical, straight, and of exact diameter to gauge. Standard tapers for assembling work are also produced by the use of similar reamers of exact taper and size.

Reaper. Machine used for harvesting grain. It delivers the grain in loose bundles or gavels at the side of the machine.



Sweep-rake Reaper.

It was the forerunner of the binder, which has now superseded it, except on small farms in the rougher portions of the country, where but little grain is raised.

Reason. In its most general sense, conscious intelligence, which is able to adapt means to a given end; also loosely used in many other senses, but most particularly to designate that logical faculty by which the mind arrives at a judgment by any process of inference from previous judgments. In a simple process of reasoning the main steps are assimilation and association; *e.g.*, I see the flame of a candle, and believe that if I place my finger in the flame it will be burned. If I perform this process with conscious reflection, the steps are these: I first recognize and identify, *i.e.*, assimilate, the presentation of the flame; I next associate it with previous experiences of other similar flames accompanied by painful sensations of heat under certain circumstances, and from these premises draw the conclusion that the flame in question will produce a similar sensation under similar conditions; viz., a sufficiently close approximation of the flame and finger. The process is even in its simple form a complex one, involving recollection and discrimination, but the chief factors are assimilation and association.

Réaumur, RENÉ ANTOINE FERCHAULT DE, 1683–1757. French physicist, pensioned 1722; discoverer of methods of making steel and opaque glass; inventor of the thermometer named from him, of which zero is the freezing point of water and 80° is the boiling point of alcohol. *Hist. des Insectes*, 6 vols., 1734–42.

Reaumur's Porcelain. Opaque glass, devitrified by sudden heating and cooling, invented by R. 1739. It is tougher and less fragile than ordinary glass.

Rebecca Riots. Series of outbreaks in England 1843–44, due to the indignation of the people at the great increase of toll-gates on the public highways. Men in female attire tore down the toll-bars by night. Their motto was from Gen. xxiv. 60.

Rebekah. In Genesis, daughter of Bethuel, greatniece of Abraham, wife of Isaac, and mother of Jacob and Esau.

Rebellion. Rising, not permanently successful, against a government; as that of the Parliament against Charles I., 1642, the results of which were overthrown 1660 by the reëstablishment of the Stuarts. Lasting success, as in England 1688–89, and in America 1775–83, converts rebellion into revolution.

Rebolledo. BERNARDINO, COUNT DE, 1597–1676. Spanish poet and official, Envoy to Denmark and Sweden. He versified Job and the Psalms.

Rebus. Puzzle in which words or phrases are represented by pictures of objects, the names of which are similar in sound to the syllables or words intended. The picture-writing of the Aztecs was of this character, they not having advanced to the alphabetic stage.

Récamier, JEANNE FRANÇOISE JULIE ADELAIDE (BERNARD), MME., 1777–1849. French beauty of high character, head of a famous salon; exiled 1811–14; friend of Mme. de Staël and Chateaubriand.

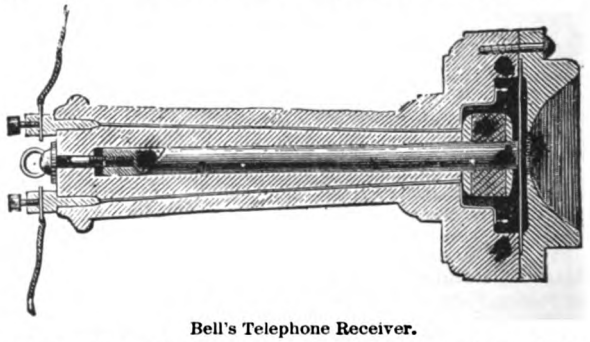
Recaption. Remedy, which the common law allows one to enforce, of retaking, without legal process, goods, wife, child, or servant wrongfully taken and withheld. Statutes and modern judicial decisions have limited its exercise.

Recapture. In International Law, taking of a captured vessel by one of the same state or of an ally. It entitles the recaptor to salvage.

Receipt. Taking possession of a thing, or written acknowledgment of such taking. It is not a contract, and may be explained by parol evidence.

Receiver. Court appointee whose duty is to take and hold the property of another, in the interest of all parties interested therein. The power of appointment is generally defined by modern statutes: the exercise of the power in each case is largely a matter of judicial discretion. Receiver's certificates are non-negotiable instruments for the payment of money, issued by receivers under the order of a court.

Receiver, TELEPHONE. Instrument employed on telephone lines to receive the electric currents and deliver their energy to the air in the form of sound waves. A convenient form is that invented by Bell, consisting of a straight steel magnet upon one pole of which is a bobbin of fine insulated copper wire. In front of and very near to this pole is a thin



Bell's Telephone Receiver.

circular iron diaphragm, capable of vibrating to and fro, following the fluctuations in the strength of the magnet caused by the varying current which passes round the bobbin. Thus sound waves are started in the air by the vibrations of the plate.

AIR-PUMP.—Bell-glass in connection with an air-pump from which the air may be exhausted. Its lower edge is ground flat, and it rests on a flat metal or ground glass plate. See AIR-PUMP.

Receptacle. In Botany, end of the peduncle. See TORUS.

Rechabites. 1. Tribe or family of Midianite origin, at Jerusalem ab. 600 B.C.; they lived in tents and used no wine. Jer. xxxv. 2–19. 2. Order of total abstainers in England and the U. S.

Recife. See PERNAMBUCO.

Reciprocal OF A QUANTITY. Unity divided by the quantity. It is indicated either in fractional form or by placing a minus sign before its exponent.

Reciprocal Equation. One in which the substitution of the reciprocal of the variable for the variable will not alter the equation. If a be a root, then will $\frac{1}{a}$ be also a root.

Reciprocally Proportional. Quality of variables when their product is constant.

Reciprocal Rectangles. Those equivalent and not equal; so called since altitudes are proportional to reciprocals of bases.

Reciprocity. Treaty relation between states, by which each is bound to accord to the other certain privileges, chiefly commercial, in return for like benefits.

Reciprocity, PRINCIPLE OF. Idea assumed to unite the interests of the individual with the good of society, his good actions gaining him esteem and advantages, and benefiting society by leading others to imitate his example.

Reciprocity Treaty. Between U. S. and Canada; concluded June 5 and ratified Sept. 9, 1854; abrogated 1866, on notice given by U. S. 1865.

Recitative. Kind of music used in opera, oratorio, and cantata, between plain speech and melody, and connecting the set or more highly organized forms of the work. In its simplest form it foregoes the raised rhythms used in artificially constructed pieces, and depends chiefly on variety of pitch; its most useful purpose is to hasten the action. When accompanied simply by an occasional chord on double bass and violoncello or pianoforte, it is called *recitativo secco* or dry recitative; when treated more melodiously and accompanied by the orchestra, it is *recitativo stromentato* or accompanied recitative. It came in with the invention of the opera.

Recke, ERNST VON DER, b. 1848. Danish dramatist, poet, and critic.

Recklinghausen, FRIEDRICH DANIEL VON, b. 1833. Prof. Würzburg 1866, and Strassburg 1872; writer on pathology.

Reclinate, or INFLEXED. Method of vernation where the upper part of a leaf is bent on the lower, as in the Tulip-tree.

Reclus, JEAN JACQUES ÉLISÉE, b. 1830. French geographer and communist, banished 1871–79. *The Earth*, 1867, tr. 1871; *Geographie Universelle*, 19 vols., 1874–94.

Reclus, PAUL, b. 1847. French surgeon. *Clinics*, 1887.

Recluse. 1. Monk or nun occupying a sealed cell, ab. 1000–1200. 2. Nun of Port Royal. 17th century. 3. Any one living in retirement.

Recognition. Feeling of familiarity accompanying the presentation of an object which has already affected consciousness. It implies reproduction and comparison. When one recognizes a familiar face, the present object of consciousness, viz., the face itself, is compared with an image which is the result of previous experiences of the same face, and is itself recognized: this comparison results in the recognition, which is clear and complete according as the image is clear and complete. The object of recognition may be either a material object or an image. The recognition of an image depends upon the completeness of the reproduction of the circumstances and associations attendant upon the original perception.

Recognizance. Common law obligation entered into before a court of record or authorized magistrate, by which the obligor acknowledges or recognizes his liability; now regulated by statute.

Recollection. See MEMORY.

Recollet. Branch of the Franciscan order, established 1592 in France; also of Augustinians, founded 1530, and others. The name marks a return to the original rule.

Reconciliation. Removal of estrangement between God and man, through the mediation or atonement of Christ.

Reconnaissance. Rough preliminary survey of a country to select an approximate location for a road or canal. Levels are taken by the barometer, angles measured by the prismatic compass, and distances determined by the pedometer or odometer.

Record, ROBERT, M.D., 1510–1558. Physician to Edward VI. and Mary; introducer of the sign of equality in algebra; author of an arithmetic, *Grounde of Artes*, 1540, and an algebra, *Whetstone of Wit*, 1557.

Recorder. 1. Class of judicial officers, having original criminal jurisdiction within a locality. 2. Officer, charged with making and keeping official written memorials and transcripts of transactions.

Recording Acts. Modern statutes providing for the public record of conveyances of property, and prescribing the legal effect of such records.

Recoupement. Legal defense which cuts down plaintiff's claim, but does not entitle defendant to an affirmative judgment.

Recovery, COMMON. Obsolete method of conveying land by a fictitious suit.

Recruit. Person who voluntarily enlists in the army. See ENLISTMENT.

Rectangle. Parallelogram having right angles only.

Rectification. Determination of the length of any curve or arc in terms of the rectilinear unit. Some familiar curves may be rectified geometrically, but the processes of the calculus are generally required.

Rectifying. Second and subsequent distillations of a volatile liquid, to free it from impurities which may have been carried over in the first distillation; particularly applied to alcohol.

Rectilinear, or RECTILINEAL. Composed of or bounded by straight lines.

Rectipetality. Tendency of vegetable organs to grow in straight lines when all external directive influences are removed.

Rector. In English Ch. and P. E. Ch., incumbent of a parish; also in Scottish Episcopal Ch. since 1890; sometimes head of a ch., school, or other establishment. See VICAR.

Rectrices. Long tail-feathers of birds.

Rectum, DISEASES OF. Those affecting the last division of the intestines. Inflammation of the part is known as proctitis; it may be the seat of malignant growths. See PROLAPSUS ANI and HEMORRHOIDS.

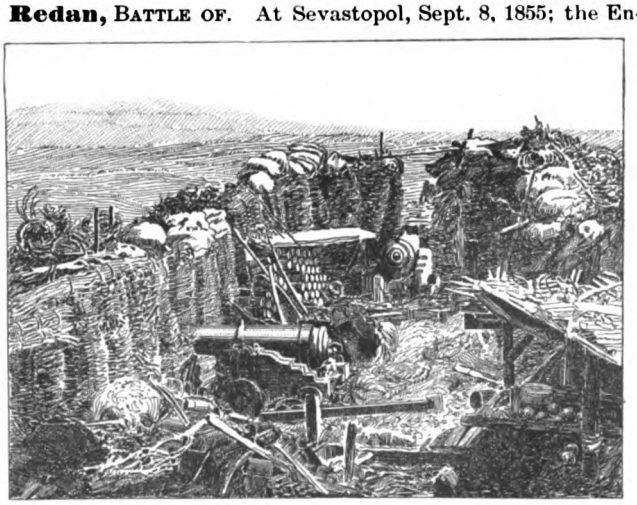
Recurring Equation. One in which the coefficients of terms equidistant from the extremes are the same, having the signs of the corresponding terms either all like or all unlike: *e.g.*, $x^5-3x^4+8x^3+8x^2-3x+1=0$. A recurring equation of odd degree has $+1$ or -1 as a root, as the corresponding terms have unlike or like signs; one of even degree, having all like signs, can be transformed to an equation of one-half the degree: one of even degree, having unlike signs and the middle term missing, has both $+1$ and -1 as roots.

Recurring Sines. One each of whose terms after a certain number is related to a number of preceding terms through a sequence of multipliers which remains unchanged throughout the series. This sequence of multipliers is called the scale of relation, and the number of terms in the scale determines the order of the series. A geometrical progression is a recurring series of the first order, the constant ratio being the scale. A recurring series of the second order will have a scale of two terms and two terms given as a basis for the series. The scale of a recurring series of the nth order can be determined if 2n terms be known.

Recurvirostridæ. See LIMICOLÆ.

Recusants. Those who fail to attend services of an Established Ch. Statutes of Elizabeth were in force against Protestant Dissenters till 1688, and against R. Catholics till 1791.

Redan, BATTLE OF. At Sevastopol, Sept. 8, 1855; the English made a successful attack on the Great R., and the French on the Little R., but were compelled to retire with great loss



Redan—View of portion of interior.

after a desperate struggle. The English lost 71 officers and 2,450 in all; the French, 1,646 killed, including 5 generals and 140 officers, 4,500 wounded, and 1,400 missing. The Russians abandoned the s. part of Sevastopol the following night.

Redan. See FIELD WORKS.

Red Bud. See JUDAS TREE.

Red Cedar. See CEDAR.

Red Cedar. River ab. 120 m. in length, rising in a series of small lakes in Wis., flowing s.w. and emptying into the Chippewa.

Red Chalk. See HEMATITE.

Red Copper Ore. See CUPRITE.

Red Cross. Societies organized to succor the wounded and dying in time of war. At a conference in Geneva, Oct. 1863, a treaty was drawn up which, after some modifications in the convention of Aug. 1864, was signed before adjournment by representatives of 12 governments, a number now more than trebled. All hospitals, ambulances, materials, etc., under the Red Cross are treated as neutral. The American association (Clara Barton, pres.) aims also to relieve sufferers from fires, cyclones, famine, and other far-reaching calamities. The symbol of the various relief societies is a red cross on a white ground.

Red Deer. See STAG.

Reddle. See HEMATITE.

Redemption. Work of Christ for his people; variously interpreted in different ages and schools of theology; nearly equivalent to salvation, which is sometimes of more personal application. See ATONEMENT.

Redemptionists, or TRINITARIANS. French order, confirmed by the Pope 1199, for the ransom of Christian slaves in the Barbary States.

Redemptorists. Severe monastic order founded by Liguori in Italy 1732, confirmed 1749. It has many houses in the U. S.

Redesdale. Valley of Northumberland, near the Scottish frontier, famous in border legends. The battles of Otterburn and Redeswire, 1575, were fought in the vicinity.

Redfield, ISAAC FLETCHER, LL.D., 1804–1876. Judge Vt. Supreme Court 1835, Chief-justice 1852–60; prof. Dartmouth 1857–61. *Law of Railways*, 1857; *Law of Wills*, 1864–70; *Law of Carriers*, 1869.

Redfield, JUSTUS STARR, 1810–1888. American publisher.

Redfield, WILLIAM C., 1789–1857. American meteorologist, prominent also in connection with steamboats, railroads, and street railways.

Red Fire. Used in pyrotechnics; usually consisting of an intimate mixture of dry strontium nitrate, sulphur, potassium chlorate, and lampblack.

Redgrave, RICHARD, 1804–1888. English landscape and genre painter, R.A. 1851, Inspector-gen. of art schools 1857–80. *Manual of Colors*, 1863; *Century of Painters*, 1866; *Reminiscences*, 1891.

Red Hand, IN HERALDRY. Sinister hand granted to baronets in England and Ireland 1611, and now to those of the United Kingdom.

Red Hematite. Fe_2O_3. One of the commonest of iron ores, in which the red color of the mineral or of its powder is a prominent character. See HEMATITE.

Red-hot Shot. Spherical shot heated to a red heat and fired from smooth-bore muzzle-loading cannon, to set vessels, wooden buildings, etc., on fire. Many of the masonry forts constructed in U. S. before the Civil war were provided with hot-shot furnaces: the use of rifled guns and elongated projectiles have made hot shot an obsolete projectile.

Redia. See DISTOMUM.

Redif Pasha, b. 1827. Turkish officer, prominent in the war with Russia 1877; since in exile.

Reding, ALOYS VON, 1755–1818. Swiss patriot, who defeated the French at Morgarten 1798, opposed the Helvetic confederation, and was Landamman of Canton Schwyz 1803 and 1809.

Red Ink. See INK.

Red Jacket, or SAGOYEWATHA, 1751–1830. Seneca chief, distinguished for his eloquence and for his services to the U. S.

Red Lead. See MINIUM.

Red-Letter Days. In the Anglican Calendar, the days of the greater feasts were printed in red letters, and the lesser in black, whence the Black-Letter Saints' Days.

Red Liquor. Solution of aluminium acetate in water; usually prepared by the action of solutions of acetate of lime and alum upon each other, when sulphate of lime is precipitated; used in dyeing.

Redoubt. Important earthen field work, completely inclosing a position to be defended: generally of four or five faces, with sufficient interior space to lodge the temporary garrison. When it is commanded by the defenses in rear its gorge is often stockaded, to prevent its being used by the enemy in the event of its capture. See FIELD WORKS.

Taking a Turkish Redoubt at Loftcha, Bulgaria.

Redpath, JAMES, 1833–1891. Scottish-American journalist and author; active against slavery; founder of lecture bureaus in Boston. *John Brown*, 1860.

Red-Polled. See CATTLE.

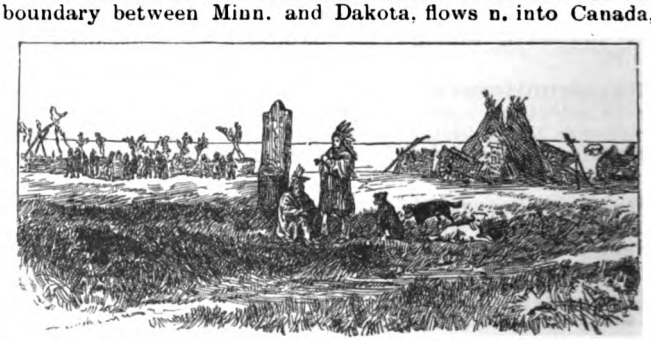
Red Precipitate. See MERCURIC OXIDE.

Red Prussiate of Potash. See POTASSIUM FERRICYANIDE.

Red River. Branch of the Mississippi. It heads in the Staked Plains of Texas, flows generally e. between Texas and Indian Territory, then s.e. across a corner of Ark., and through La. to its mouth. Length 1,550 m., drainage area ab. 90,000 sq. m., average flow 57,000 cu. ft. per second.

Red River Expedition. Planned by Gen. Halleck; conducted by Gen. Banks, who started March 25, was defeated at Sabine Cross-Roads by Kirby Smith April 8, and began his retreat; defeated the Confederates at Pleasant Hill April 9, and reached Alexandria April 22.

Red River of the North. Heads in Lake Elbow on the boundary between Minn. and Dakota, flows n. into Canada, and into Lake Winnipeg. The region it traverses is a nearly level plain, once the bed of Lake Agassiz, and is famed for the excellence of its wheat harvest. Drainage area ab. 44,000 sq. m., three-fourths of it being in the U. S. Length 750 m.



Boundary Post between U. S. and Rupert's Land, at Pembina, N. Dak., on Red River.

Redroot. 1. *Gyrotheca tinctoria.* Woolly herb of the natural family *Hæmodoraceæ*, growing in swampy places in the e. U. S. 2. Certain shrubs of the genus *Ceanothus*, natural family *Rhamnaceæ*, natives of N. America.

Redruthite. Cu_2S. Variety of the mineral chalcocite, occurring in well-formed crystals at Redruth in Cornwall.

Red Sea. Long narrow arm of the Indian Ocean, between Asia and Africa, separating Arabia from Egypt, the Soudan and Abyssinia. It connects with the Indian Ocean by the Strait of Babel Mandeb and the Gulf of Aden. Length 1,450 m., maximum breadth 230 m.

Red Seaweeds. See ALGÆ and SEAWEEDS.

Red Silver Ore. Common name for the minerals PYRARGYRITE and PROUSTITE (q.v.). The former is known as the dark red, the proustite as the light red ore.

Red Snow. *Protococcus nivalis.* Minute red plant of the sub-kingdom *Protophyta*, occurring abundantly in arctic and alpine regions, and superstitiously regarded as blood.

Red Sulphur Springs. Watering place in W. Va., 38 m. s.w. of White Sulphur Springs. The water contains phosphorus and a gelatinous sulphur compound which is its distinctive feature.

Red Sunset. Peculiar rich and long-enduring sunset phenomena, observed, as also a red sunrise, throughout the n. temperate zone 1883, and enduring for three years, but slowly diminishing in intensity. Similar phenomena, but less extensively distributed, were observed 1831 and other years.

Red Top. *Agrostis vulgaris.* Pasture grass of n. hemisphere; in its habits somewhat similar to blue grass, but taller and finer. It is especially adapted to moist and wet soils, and makes a fine hay of excellent quality.

Red Top, FALSE. *Poa serotina.* Tall meadow grass of the n. hemisphere, known also as Fowl Meadow-Grass.

Reduced Length OF AN ELECTRIC CONDUCTOR. Length of a column of mercury of one square millimeter cross section which offers the same resistance as the conductor.

Reduced Thickness OF A DIELECTRIC. Thickness of a layer of air that would have the same inductive capacity as the dielectric. It is equal to $\frac{t}{k}$, in which t is the thickness of the dielectric and k its specific inductive capacity.

Reducing Agent. Substance which will readily abstract oxygen from other substances; *e.g.*, hydrogen and carbon.

Reductio ad Absurdum. Process of reasoning by which a proposition is proved by proving the falsity of its contradictory opposite.

Reduction. Process occurring when a chemical compound containing oxygen gives up a portion or all of its oxygen to some other compound or element. When compounds containing other elements give up these, reduction is also said to have taken place; *e.g.*, when $FeCl_3$ becomes $FeCl_2$.

Reduction, IN MATHEMATICS. 1. Process of changing form without changing value or relations. 2. Process of reaching a result in general terms applicable to all cases under the form which is discussed.

Reduction Factor. See GALVANOMETER.

Reduplication. In Botany, regular doubling of flowers.

Reduplication. Repetition of part of the root of a verb in order to express change of tense; common in Greek and Latin, and even in Gothic; best shown in English by the preterit *did* from the present *do*.

Redwald. King of East Angles 597; Bretwalda.

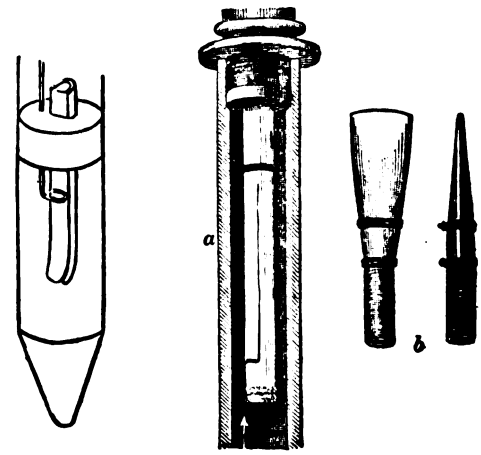
Redwitz-Schmölz, OSCAR, FREIHERR VON, 1823–1891. Bavarian poet and novelist. *Amaranth*, 1849; *Odilo*, 1878; *Hymen*, 1887.

Red-Wood. *Sequoia sempervirens.* Very large tree of the natural family *Coniferæ*, native of the Pacific coast of the U. S.; extensively lumbered.

Redwood, ABRAHAM, 1709–1788. Founder of the Redwood Library at Newport, R. I., 1747–50.

Reed. *Phragmites phragmites.* Large grass, growing in swamps in the n. temperate zone.

Reed. Simple elastic tongue of metal or wood contained in many musical instruments, and designed to set the air into vibration. It is usually moved by a current of air, though it is vibrated in the Jew's-harp by the finger. If it vibrates freely in an aperture and just escapes grazing the edges, it is



Organ Reed. *a*, Bagpipe Reed. *b*, Bassoon Reed.

called a free reed; *e.g.*, that of a harmonium or concertina. If it is larger than the orifice and strikes against the edges at each oscillation, it is called a beating reed; *e.g.*, that of the clarionet or bassoon. See ORGAN PIPE.

Reed, ANDREW, D.D., 1787–1862. Cong. pastor in London 1811–61. Some of his hymns, 1817–25–42, are widely used.—His wife, ELIZA (HOLMES), 1794–1867, was also a hymnist.

Reed, DAVID BOSWELL, M.D., 1805–1864. Scottish chemist and writer, interested especially in ventilation; in the U. S. from 1856.

Reed, SIR EDWARD JAMES, b. 1830. English designer of ironclads; chief constructor of the navy ab.1860–70; M.P. 1874–92; knighted 1878. *Japan*, 1880.

Reed, HENRY, LL.D., 1808–1854. Grandson of Joseph; prof. Univ. Pa. from 1831. His *Lectures on English Literature*, 1855, and on the *British Poets*, 1857, were edited by his brother, WILLIAM BRADFORD, 1806–1876, prof. Univ. Pa. 1850, Minister to China 1857–60, and biographer of Joseph Reed, 1847.—Henry's son, HENRY, 1846–1896, was Judge of Common Pleas in Phila. from 1886. *Statute of Frauds*, 3 vols., 1884.

Reed, JOSEPH, 1741–1785. Sec. and aid to Washington 1775–78; active in several battles; Brig.-gen. 1777; delegate to Congress 1778; Pres. Pa. Executive Council 1778–81, and practically Governor. When offered a bribe of £10,000, he replied: "I am not worth purchasing, but, such as I am, the king is not rich enough to do it."

Reed, THOMAS BRACKETT, b. 1839. Attorney-gen. of Me. 1870–72; M.C. since 1877, and Speaker of the House 1889–91 and 1895–97; Republican leader.

Reed Bird. See BOBOLINK.

Reeder, ANDREW HORATIO, 1807–1864. First Gov. of Kansas 1854–55. He denounced the fraudulent Legislature, and by the Freesoilers was elected to Congress and the U. S. Senate, but not admitted.—His son, FRANK, b. 1845, is prominent in Pa. Republican politics.

Reed Instruments. Generic name of a class of instruments, the tones of which are produced by a reed. They were known among the Chinese, but most are of modern invention. See ORGAN, HARMONIUM, and MELODEON.

Reed-Mace. See CAT-TAIL.

Reef. See CORAL.—In Australia, auriferous quartz vein.

Reel. Scottish dance, varied in the Va. form.

Re-entrant Angle. Interior angle of a polygon greater than 180°.

Re-entrant Polygon. One having one or more re-entrant angles.

Rees, or ARICKAREES. Indian tribe of Pawnee origin, which lived on the upper Missouri, whither they had migrated; unfriendly to the whites. They now number ab.1,000, on a reservation with the Mandans. See PAWNEES.

Rees, ABRAHAM, LL.D., F.R.S., 1743–1825. Unitarian minister in London from 1768; ed. *New Cyclopedia*, 45 vols., 1802–20.

Rees, JOHN KROM, b. 1851. Astronomer; prof. Columbia Coll. 1881.

Reeve. English local magistrate of former times.

Reeve, CLARA, 1725–1803. English novelist. Tr. Barclay's *Argenis*, 1772; *Old English Baron*, 1777–78.

Reeve, HENRY, D.C.L., 1813–1895. Registrar of Privy Council 1837–87; ed. *Edinburgh Review* 1855; historical writer.

Reeve, TAPPING, LL.D., 1744–1823. Founder and head of the first law school in the U. S., at Litchfield, Conn., 1784–1820. *Law of Baron and Femme*, 1816; *Law of Descents*, 1825.

Reeves, JOHN, 1752–1829. Chief-justice of Newfoundland 1791–92 *History of the Law of Shipping*, 1792; *History of English Law*, 5 vols., 1784–1829.

Reeves, JOHN SIMS, b. 1822. English singer, highly popular as a tenor 1847–91.

Reeving. Passing a rope through a hole or channel of a block made to receive it.

Re-exchange. Loss resulting from the dishonor of a bill of exchange in a different country from that where it is drawn or indorsed.

Refectory. Dining hall or fratery, of a convent or college. The arrangements were similar to those of the ordinary

Refectory, Convent of St Catherine, Mt. Sinai.

domestic halls. It was usually provided with a pulpit, from which one of the inmates read to the others during meal time.

Referendum. Submission by the legislature of a proposed law to popular vote.

Reflecting-Anemometer. Aime's apparatus, invented 1846, for observing the direction and velocity of motion of the clouds, *i.e.*, of the upper winds. This and similar apparatus are now styled NEPHOSCOPE (q.v.).

Reflecting Power. Property of a surface by which it reflects regularly a greater or less proportion of the radiant energy incident upon it. Its value is the ratio of the energy reflected to the whole amount incident. This quantity is always inversely proportional to the absorbing power of the medium beyond the surface. The reflecting power increases with the angle of incidence. That for water at a perpendicular incidence, according to Bouguet, is ab. 0.018; for an incidence of 89.5° it is 0.721. Again the differences in the reflecting powers of different substances are much more marked at small than at great incidences. Thus water and mercury reflect about the same proportion of the incident light at 89.5°, while at a perpendicular incidence mercury has a far higher reflecting power.

Reflecting Telescope. The image is formed by means of a concave mirror; the eye-piece may be placed in the focus of the mirror in front, or a reflector may be employed to throw the image back through an orifice in the mirror to the eye-piece placed behind it. Four different forms have been employed, the NEWTONIAN, GREGORIAN, HERSCHELIAN, and CASSEGRANIAN (q.v.).

Reflection. Abrupt change in the direction of propagation of a wave front in an elastic medium when it is incident upon a surface. The laws of reflection are: (1) The ANGLE OF REFLECTION (q.v.) is equal to the ANGLE OF INCIDENCE (q.v.): (2) the incident ray, the reflected ray, and the normal are all in the same plane. In the case of radiant energy these two laws apply to specular or regular reflection, such as takes place from polished surfaces. The phenomenon of total reflection takes place when a ray of radiant energy is incident upon the surface of a medium optically less dense, and at an angle greater than the critical angle for that particular wave length.

Total Reflection.

Reflex Action. Muscular or other activity caused immediately by a sensory impulse without the necessary intervention of consciousness; *e.g.*, if the sole of the foot be tickled, the foot will be withdrawn; or if a foreign body approach the cornea of the eye, the eyelid winks. The necessary elements are a sensory impulse carried along a sensory tract, a reflex nervous center, and a motor tract and organ. The great center for reflex action is the spinal cord. Certain parts of the brain however have reflex functions. The most marked feature of reflex actions is their purposeful character, the kind of activity being determined largely by the kind of sensory impulse. This characteristic is a strong support for the theory that reflexes were originally voluntary movements of a purposeful kind, which became habitual and involuntary, and are now inherited. The character of the reflex movement is also influenced by the intensity of the stimulus, a slight stimulus calling out one movement, and a strong stimulus at the same spot calling out a response quite different. Further, the movement varies according to the part of the body stimulated; *e.g.*, a cinder in the eye may cause active winking, while the same body on the mucous membrane of the larynx will bring about violent reflex coughing, directed toward the expulsion of the irritating substance. Reflex actions may be partly or wholly arrested by act of will or by another sensory impulse. The time required for a reflex act varies with the act and with the stimulus, the greater part of the whole time being taken up in the central change by which the sensory is transformed into a motor impulse. The nature of this central function is unknown. Certain of these reflexes are absent in diseased conditions, others are not present in health. Consequently, a study of the reflexes assists in determining the presence of some diseases.

Reflex Sentiments. Those feelings and desires which arise from our recognition of other men's feelings toward ourselves, as our desire of esteem, the love of fame, or of glory.

Reformation. Movement, first conspicuous under Luther 1517, by which a great part of western Christendom was rent away from ecclesiastical obedience to Rome. It was most effective in Germany, Switzerland, Holland, the Scandinavian countries, Scotland, and England. In Spain and Italy it was stamped out; in France it occasioned the Huguenot wars; in Bohemia, where it had been anticipated by a century, its fruits were destroyed, as in parts of Germany, by the Thirty Years' War.

Reformatories. See PRISON and PRISON DISCIPLINE.

Reformed Church IN THE UNITED STATES. Organized 1747; called German Reformed till 1867. It has ab. 950 ministers and 225,000 communicants.

Reformed Church OF AMERICA. Organized in New Amsterdam 1628; called Reformed Protestant Dutch till 1867; especially strong near the Hudson. Ministers ab. 620, communicants above 100,000.

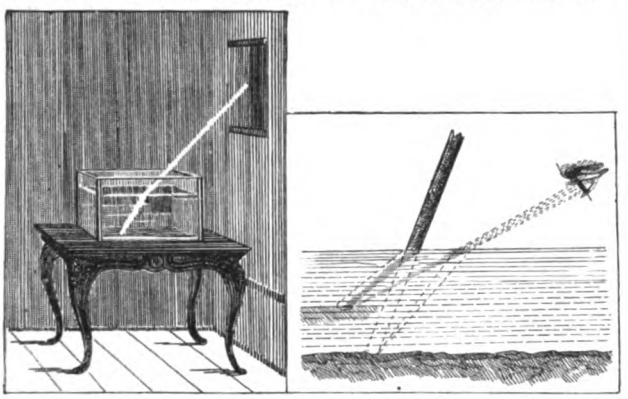
Reformed Episcopal Church. Founded 1873 by the secession of Bp. Cummins of Ky. from the P. E. Ch. It acknowledges non-episcopal ordination, has 8 bishops, ab. 110 ministers, and ab. 11,000 members.

Reformed Presbyterians, CAMERONIANS, or COVENANTERS. Organized in Scotland 1680, and in America 1774; connected with Associate Pres. 1782. See PRESBYTERIANS.

Refracting Angle. In an optical prism, angle between the face upon which the radiation is incident and that from which it is emergent. See PRISM.

Refracting System. Mode of lighting a lighthouse. A central lamp is used, the rays from which are transmitted through a combination of lenses surrounding it. Also called the Dioptric System.

Refraction. In general, when any form of wave motion passes from one medium into another, the direction of the propagation is changed; this bending or change of direction is refraction. It takes place notably in the case of sound, as demonstrated by the experiments of M. Sondhaus; also in the case of radiant energy, which presents by far the most scientific interest. The laws governing the refraction of light were first stated by Snell, but were made more generally known by Descartes. The INDEX OF REFRACTION (q.v.) is usually indicated by μ. The diamond is one of the most refractive media known, and owes its brilliancy to this property. The index



Appearance of Stick in Water.

varies from 2.44 to 2.75. The index for water is 1.33, and that for crown glass ab. 1.56. The refractive power of organic substances has been found to be closely related to their composition. If a substance whose density is ρ contains carbon, hydrogen, and oxygen, the numerical quantity, $\frac{m(\mu-1)}{\rho}$, in which m is the molecular mass, is constant. This quantity is called the MOLECULAR REFRACTIVE (q.v.) energy of the substance. This number may be predicted from the chemical formula of the substance, $C_aH_bO_c$, by finding the value of $(5a+1.3b+3c)$. See LAWS OF REFRACTION.

Refractional Focus, NODAL POINT, and PRINCIPAL POINT. Three of the six CARDINAL POINTS (q.v.), of an optical lens system.

Refractory Ores. Ores, especially of silver and lead, that are difficult to treat by the simpler smelting processes, owing to the presence of antimony or other chemical element, that is liable to form an undesirable alloy with the metal sought, or will necessitate an unusually high heat in the furnaces.

Refugees. Those who fled to England from persecution in the Low Countries under Philip II., and in France 1685; thence any exile from religious or political reasons.

Refunding. Process of substituting for interest-bearing bonds representing a national debt other bonds bearing a lower rate of interest. The option is generally given to the holders of the bonds of either receiving their face value or accepting the reduced rate of interest.

Regaldi, GIUSEPPE, 1809–1883. Italian poet, noted in early life as an improvisator; prof. Bologna from 1866.

Regalia. Crown, scepter, and other emblems of royalty, used chiefly at coronations. Those of England are mostly kept in the Tower of London, and valued at £3,000,000.

Regel. EDUARD VON, 1815–1892. Director of the botanical gardens in St. Petersburg 1875. *Die Parthenogenesis im Pflanzenreiche*, 1859; *Monographia Betulacearum*, 1861; *Tentamen Floræ ussuriensis*, 1861.

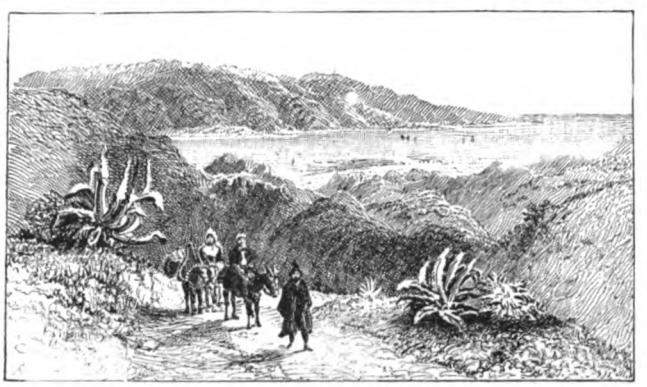
Regelation. Phenomenon noticed 1850 by Faraday, that two pieces of ice at 0° C. if brought in contact would freeze into one piece. The cause has been the subject of wide discussion. As the melting point of ice is lowered by 0.0074° C. for every atmosphere of pressure applied, a slight pressure upon the pieces in contact will melt a very thin layer of liquid between them, which will immediately refreeze if the pressure be removed. The motion of the glaciers in the Alps has been supposed by Tyndall to be dependent on this principle of regelation, instead of being due to ice viscosity, as contended by J. D. Forbes.

Regeneration. New birth or awakening to spiritual life; by some connected with baptism, by others with conversion. Like every other doctrine, it has been variously held; but in all views except the Pelagian it implies innate depravity and divine grace.

Regensburg. See RATISBON.

Regent. One who temporarily exercises royal authority, as during the minority of Louis XIV., when his mother, Anne of Austria, was regent; or the madness of George III., when the Prince of Wales was appointed to this position; or now in Bavaria, where Prince Luitpold is regent, on account of the insanity of King Otto.

Reggio. Anciently Rhegium; town of s.w. Italy, on Strait of Messina; founded from Chalcis ab.725 B.C.; ruined by Syracusans 387 B.C.; restored under Roman rule; taken by



Reggio.

Goths 410 and 549, by Saracens 918, by Normans 1060, and by Ottomans 1552 and 1597; destroyed by an earthquake 1783. Pop., with suburbs, ab. 43,000.—Another Reggio, 17 m. s.e. of Parma, gave birth to Ariosto, and has a notable cathedral.

Regicides. 150 commissioners appointed to try King Charles I. of England: 70 acted, 59 signed the death warrant Jan. 1649; of these, 29 were tried and 10 executed Oct. 1660; others were imprisoned. Three of them, Whalley, Goffe, and Dixwell, escaped to New England. The first two were concealed for some two years at New Haven and Milford, Conn., and afterward in Hadley, Mass. Whalley d. 1674; Goffe d. 1679.

Regillus, LAKE. In Latium, Italy; scene of a victory of Romans over Latins, 498 B.C., celebrated in Macaulay's *Lays*.

Regiment. Military organization composed of officers, non-commissioned officers and men, forming a relatively permanent association, and commanded by a colonel. It is the unit of administration in all armies and often the tactical unit also: it is the center of instruction and recruiting and the organization referred to in historical and other records. Regiments are combined into brigades, brigades into divisions, and divisions into corps. A battalion comprises two or more companies of a regiment. In the U. S. service the infantry regiment consists at present of 35 commissioned officers and 517 enlisted men. A German regiment had, until recently, three battalions of four companies each. There are now four battalions. On the peace footing, a company numbers 150 men rank and file. During war and during the maneuvers the effective strength is raised to 250 men. A German regiment is thus 4,000 strong.

Regimental Colors. In U. S., a silken standard carried in battle, upon campaigns, and at reviews and inspections. For Infantry, the colors are of blue silk bearing the coat-of-arms of the U. S. and on a red scroll the name of the regiment embroidered in white. For Cavalry, yellow silk similarly adorned; and for Artillery and Engineers, scarlet silk with the

appropriate emblems of crossed cannon or the castle embroidered upon them. The cord and tassels of the regimental colors correspond in color to that of the arm of service, but the fringes are yellow for all except engineers, which is white.

Regimental Courts-Martial. Courts composed of regimental officers to try soldiers for offenses not capital: jurisdiction does not extend to capital cases nor for the trial of officers: they cannot inflict a fine exceeding one month's pay, nor can they sentence a soldier to imprisonment or to hard labor for a longer period than one month.

Regiomontanus (JOHANN MÜLLER). 1436–1476. German mathematician, at Rome from 1474. He introduced a number of important improvements into practical astronomy, as the employment of clocks driven by weights. The calendars computed by him were of great service to Columbus and other navigators of that day. His work *De Triangulis* was the first modern systematic discussion of Plane and Spherical Trigonometry.

Registration of Land. Compulsory entry on a public register of sales and mortgages of land, to facilitate transfers and assure the validity of titles.

Regma. Fruits of plants of the family *Euphorbiaceæ*.

Regnard, JEAN FRANÇOIS, 1656–1709. French dramatist of the school of Molière; noted for broadly humorous dialogue.

Regnault, HENRI VICTOR, 1810–1878. French chemist and physicist, pupil of Liebig; prof. Coll. de France 1841; director porcelain works at Sevres 1854; best known by his investigations in organic chemistry and physico-chemistry. *Cours Élémentaire de Chimie*, 1847–49.—His son, ALEXANDRE GEORGES HENRI, 1843–1871, a painter of great power and promise, was killed in the war with Germany.

Regnault, JEAN BAPTISTE, BARON, 1754–1829. French painter, eminent in classical subjects.

Regnier, MATHURIN, 1573–1613. French satirical and elegiac poet.

Regular. Flowers in which the parts of each circle are alike in form and size.

Regular Clergy. In R.C. Ch., members of a monastic order, as opposed to the secular or ordinary parish priests.

Regular Figure. One in which the elements of each kind are equal; *e.g.*, a regular polygon is equilateral and equiangular. A regular pyramid has its lateral faces equal and its base a regular polygon.

Regularia (SEA URCHINS). See ENDOCYCLICA.

Regulars. Catholic Christians, male or female, lay or clerical, who follow a *regula pietatis*, and take at least the three vows of chastity, poverty, and obedience to special superiors. Nuns in U. S. usually take simple vows, from which they are more easily released.

Regulus. Alchemistic term meaning the little king; first applied to antimony. In Metallurgy, an impure metal obtained from its oxide or sulphide by fusion with a reducing agent.

Regulus = α-LEONIS. First magnitude star. Right ascension 10h. 2m. 28s., declination 12° 30′ 34″ N.

Regulus, MARCUS ATILIUS. Consul of Rome 267 and 256 B.C.; general in first Punic war, taken prisoner 255. The tale of his dissuading the Senate from making peace or exchanging prisoners, and of his tortures and death at Carthage, is not now accepted.

Rehan, ADA, b. 1859 in Ireland. American actress, prominent in comedy parts since 1876; well known in England since 1888.

Rehoboam. King of Judah ab.975–958 B.C.; son and successor of Solomon. By his harshness of reply to a popular demand for a reduction of taxes he lost all his kingdom except the tribes of Judah and Benjamin.

Rehoboth. 1. Name of one of the four Assyrian cities founded by Asshur (Gen. x. 11). 2. Well dug by Isaac, 20 m. s. of Beersheba (Gen. xxvi. 22). 3. City of an Edomite king, supposed to be Rachaba, 4 m. e. of the Euphrates (Gen. xxxvi. 37).

Reichenbach. Town of Silesia, s.e. Prussia; scene of a defeat of Austrians under Daun by Frederic II., Aug. 16, 1762.

Reichenbach, HEINRICH GOTTLIEB LUDWIG, 1793–1879. Prof. Dresden 1820. *Taschenbuch für Gartenfreunde*, 1827; *Iconographia botanica exotica*, 1827–30; *Iconographia botanica, seu criticæ*, 1823–32; *Flora germanica*, 1830–32; *Flora exotica*, 1834–36; *Icones Floræ mediæ europeæ*, with H. G. Reichenbach, 1834–70.

Reichenbach, KARL, BARON VON, 1788–1869. German chemist, discoverer of paraffin, creosote, and the odic force; prolific writer.

Reichenhall. Summer resort in s.e. Bavaria, 10 m. s.w. of Salzburg; noted for its springs and salt-works. It has the

Reichenhall.

most important salt mines of Bavaria. The saline and ferruginous springs of Achselmannstein are much frequented, and have been famous since the 8th century. Pop. ab. 4,000.

Reichensperger, AUGUST, 1808–1895. German R. C. leader in Reichstag; writer on archæology and art.

Reichert, EDWARD TYSON, M.D., b. 1855. Prof. Univ. Pa. 1886. *Physiology*, 1894.

Reichstadt, DUKE OF. See NAPOLEON II.

Reichstag. See GERMANY.

Reid, CHRISTIAN. See TIERNAN, MRS.

Reid, GEORGE, b. 1841. Scottish portrait and flower painter and illustrator.

Reid, MAYNE, 1818–1883. Born in Ireland; resident in the U. S. 1838–49; Captain in the war with Mexico; author of ab. 50 tales of adventure for boys.

Reid, ROBERT RAYMOND, 1789–1841. Judge Ga. Superior Court 1816–19 and 1823–25; M.C. 1819–23; Gov. of Fla. from 1839.

Reid, SAMUEL CHESTER, 1783–1861. Seaman, who with a privateer at Fayal fought three British vessels Sept. 26 and 27, 1814; sailing-master U.S.N. from 1815; designer of the U. S. flag in its present form.

Reid, THOMAS, 1710–1796. Prof. Aberdeen 1752, and Glasgow 1763–81; founder of the Scottish school of philosophy. His system is an attempt to refute the skepticism of Hume and the idealism of Berkeley by an appeal to common sense. *Inquiry into the Human Mind*, 1764; *Intellectual Powers*, 1785; *Active Powers*, 1788.

Reid, WHITELAW, b. 1837. Ed. New York *Tribune* 1869, chief owner 1872; U. S. Minister to France 1889–92. Special Ambassador to Queen Victoria's Jubilee 1897. *Newspaper Tendencies*, 1879.

Reign of Terror. In France 1793–94, under Robespierre and the Jacobins.

Reimarus, HERMANN SAMUEL, 1694–1768. Prof. Hamburg from 1729. His *Wolfenbuttel Fragments*, pub. 1777, are of the extreme rationalist school.

Reims. See RHEIMS.

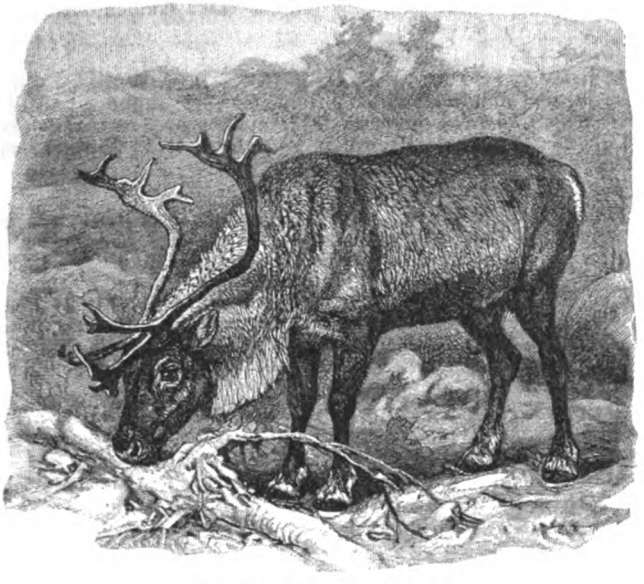
Rein, JOHANNES JUSTUS, b. 1835. Prof. Marburg 1875, and Bonn 1883. *Japan*, 1881–86, tr. 1884–89.

Rein, WILHELM, Ph.D., b. 1847. Prof. Jena 1886; writer on pedagogy.

Reinaud, JOSEPH TOUSSAINT, 1795–1867. French orientalist.

Reindeer (RANGIFER TARANDUS). Arctic deer, with horns on both sexes, antlers palmated at tip, and one or both bearing a palmated brow-antler. The horns are cast in Dec., and fully restored by Sept., the time of rut. The hoofs are spreading, adapted for walking on bogs and frozen snow. A breast-mane is present in winter. There is one wild variety, and, in the Old World, also two domesticated and smaller varieties, Mountain and Forest Reindeer; the latter pasture all the year

in woods, which are shunned by the former in summer because of gad-flies and bot-flies. The food in winter consists of buds and lichens. These animals are polygamous; the stronger males secure large harems through contest. The female drops a single fawn, often on a snowdrift, in April or May. The average herd of the Lapp does not exceed 500; but herds of 50,000 are known among other tribes. Wild Reindeer also go in large herds. A female yields half a pint of rich milk, equal to eight times as much cow's milk. Reindeer are used also for draft purposes, and are even ridden by the Kamchatdales. The Caribou, which is the American Reindeer, is found in the northern parts of Canada. There are two species. 1. *Rangifer grœnlandicus*, the Barren-ground Caribou, is smaller than (2),



Reindeer (*Rangifer tarandus*).

but with larger horns. The summer coat is reddish-brown, whiter in winter. The does migrate toward Greenland in May, drop their young, and lose their horns. They live on grasses. In Sept. the deer return to the southwest and live on lichens on the trees or under the snow. After the rut the bucks lose their horns in Nov. 2. Woodland Caribou, (*R. caribou*) is more southern in habitat; dun gray in color in summer. They migrate at night in spring and autumn, average 42 in. high at shoulder and are much hunted, especially in Dec. U. S. Government has introduced reindeer into Alaska from Siberia, as a food supply for the Eskimos, and Lapps to instruct them in rearing them (1892–95).

Reindeer Moss. *Cladonia rangiferina.* Finely-branched lichen, native of the n. hemisphere, and especially abundant in sub-arctic regions. It is an important food plant to the reindeer.

Reinecke, KARL, b. 1824. German composer and teacher of music; prof. Leipzig Conservatory 1860.

Reinhart, BENJAMIN FRANKLIN, 1829–1885. American painter, especially of portraits.—His nephew, CHARLES STANLEY, 1844–1896, was noted as an illustrator.

Reinick, ROBERT, 1805–1852. German lyric poet.

Reinkens, JOSEPH HUBERT, D.D., 1821–1896. Prof. at Breslau 1853; suspended for his protest against papal infallibility 1870; Old Catholic bishop 1873. *Revolution and Church*, 1876; *Unity*, 1877.

Reinmar, ab.1160–ab.1207. German minnesinger.

Reis Effendi. Presiding effendi. Medium of communication between the Turkish government and the representatives of foreign powers. The office has been abolished. See EFFENDI.

Reiset, JULES, 1818–1896. French chemist.

Reisig, CHRISTIAN KARL, 1792–1829. German philologist, prof. at Halle 1824.

Reiske, JOHANN JACOB, 1716–1774. Head of the gymnasium at Leipzig 1759; tr. Plutarch, 1782; editor of sundry Greek classics.

Reiss, WILHELM, b. 1838. German traveler in S. America. With A. Stübel he pub. *The Cemetery of Ancon*, 3 vols., 1880–87.

Rejuvenescence. In Biology, formation of a new cell from the contents of an old one.

Reland, HADRIAN, 1676–1718. Prof. Utrecht 1699. *Palestine from Old Monuments*, 1714.

Relapsing Fever. Specific disease manifested by a febrile paroxysm lasting about six days, followed by a remission of the same length, and a second paroxysm. These paroxysms and remissions may be repeated three or four times, whence the name. Also called Famine Fever. Classed among the infectious diseases and caused by the spirilum of Obermeier.

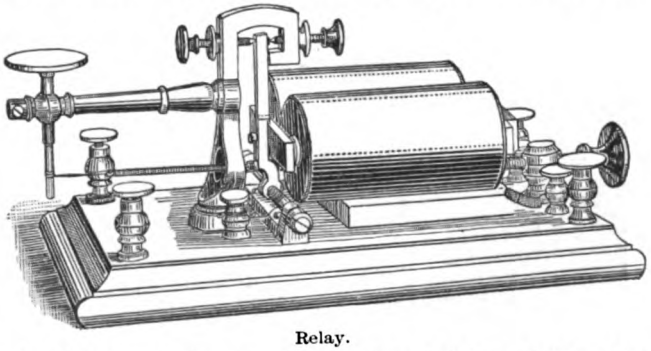
Relation. Connection of some kind between two terms or phenomena; reducible to three fundamental forms, of space, time, and cause.

Relative Ethics. Distinguished from absolute ethics; system concerning the conduct of imperfect men living under present imperfect social conditions.

Relative Humidity. See HYGROMETRY.

Relativity. Psychological principle according to which change of some sort is necessary to consciousness. This dependence was formulated by Hobbes in his famous dictum, "Semper idem sentire ac non sentire ad idem revertunt," which is, roughly, the presence of always the same sensation would be the same as the presence of no sensation at all. The principle is spoken of usually as the Law of Relativity. It is also extended to the whole subject of the variability of sensation according to preceding and accompanying circumstances, as in the phenomena of contrast.

Relay. Device employed on long telegraph lines for translating the signals of a feeble current from a distance into those of a stronger current from a local battery. It consists of an electromagnet of many turns of fine wire, the armature of which is carried upon a lever, forming a part of the new cir-



Relay.

cuit. Whenever the armature is attracted toward the poles of the magnet, the local circuit is closed by a contact point at the top of the lever, and a current from the battery flows through the local circuit containing the sounder.

Release. Legal extinguishment of a right, by act of the parties or by operation of law.

Relics. Remains or belongings of saints and martyrs; valued in the Ch. from an early period; held in extreme reverence and endowed with wonder-working powers in the Middle Ages; hence fraudulently multiplied on so large a scale that several Councils attempted to restrict their use except when of approved genuineness.

Relief. In Architecture, raised carving.

Relief, PRESBYTERY OF. Formed in Scotland 1761; synod constituted 1774; merged, with the Secession Ch., into the United Presbyterian Ch. 1847. See PRESBYTERIANS.

Relieving Arch. One constructed at the back of a retaining wall to prevent the full pressure of the earth being brought against the wall.

Religion. Belief in and worship of supernatural forces or beings. Mere belief in their existence does not go beyond the philosophic stage of thought, and hence a cult, mode of worship, propitiation, or attitude of reverence toward divine beings is necessary to complete religion and to give it the practical influence upon life which it actually exercises. The instinct of worship is almost universal, and has found vent in innumerable forms of belief. Christianity, in its various shapes, is dominant in Europe and America, Islamism in s.w. Asia and parts of Africa. Brahminism, Jainism, and Buddhism arose in India; the latter, varying with time and place, has penetrated to China and Japan, which it shares with Confucianism and Taoism. Many forms of fetichism are found among barbarous

tribes. The science of Comparative Religion has arisen of late years, largely from the study of Hindu, Persian, and Chinese sacred books, and is as yet scarcely beyond its infancy.

Relly, JAMES, 1729–ab.1780. Father of Universalism in England; zealous and prolific but feeble writer in prose and verse. *Union*, 1759.

Remainder. Estate which is not to take effect and be enjoyed until another estate is determined.

Remaining Velocity. The velocity that a projectile has at the instant of striking.

Remak, ROBERT, 1815–1865. Prof. Berlin; microscopist and electrician.

Remakian Schema OF CELL DIVISION. Form of division in which the nucleolus constricts into two pieces, followed successively and similarly by the nucleus and later by the cytoplasm; also called direct cell division.

Remarque Proofs. The first proofs of a regular published edition of an engraving or etching. A sketch is made in the margin of the plate, which shows in the proof; this is erased after a certain number of impressions are taken.

Rembrandt van Ryn, 1607–1669. Greatest of Dutch painters. Besides his masterly portraits, of which a number are in the U. S., especially in the N. Y. Metropolitan Museum, his best known works are the *Night Watch* and the *Cloth Masters* in Amsterdam, and the *Anatomy Lesson* at the Hague. His forte in painting was the use of light and shadow in such ways as to bring out character and accent thought. As a colorist and brush painter Velasquez is his only rival among men of his time. Aside from the pictures named, the Hague, St. Petersburg, and Cassel probably have the finest examples.

Anatomical Lecture of Dr. Tulp, by Rembrandt.

He was also the greatest master of etching that ever lived. He put his thoughts on the copper in the simplest and most artistic manner. His best known plate is *Christ Healing the Sick*, also known as the Hundred Guilder Print, because R. sold one for that sum, ab. $40. An impression in good preservation has recently been sold for nearly $6,000. *Hagar dismissed by Abraham* is one of the most delicate and valued of his works, and *The Descent from the Cross* and *The Death of the Virgin* are important plates. He etched several fine portraits of himself.

Remenyi, EDWARD, b. 1830. Hungarian violinist, known in U. S. and Europe from 1849.

Remiges. Quill feathers of the wing of birds.

Remigius. 1. 437–533; Bp. of Rheims 459; converter of the Franks; canonized. 2. Abp. of Lyons 853; supporter of Gottschalk's predestinarian doctrine. 3. Monk of Auxerre, teacher at Rheims 882; commentator; d. ab.908.

Remington, FREDERICK, b. 1861. American artist, illustrator, and writer, noted for his delineations of cowboys, Indians, and soldiers in the West.

Remington, PHILO, b. 1816. American inventor or improver and manufacturer of breech-loading rifles and typewriters.

Remington Rifle. Breech-loader whose block is practically a circular steel sector hinged at the center of the circle to the frame in rear of the barrel. When the block is rotated to the front it closes the breech. In this position it is locked by the hammer, which in falling to fire the cartridge bears against an accurately shaped surface on the rear radial surface of the sector: the hammer after firing the cartridge locks the block. The hammer is cocked and the block rotated to the rear by pressing the thumb on a projection on the block, which also withdraws the empty cartridge case. The extractor works in a recess cut on the left side of the chamber. The cartridge is fired by a firing pin located in the block.

Remittent Fever. Form of malarial fever where the temperature does not become normal during the intermissions between the paroxysms. The fever remits in intensity but does not intermit.

Remonstrance. Moved by Pym, Nov. 22, 1641, against sundry acts of Charles I., and carried in the Commons; a turning-point in the struggle for liberty.

Remonstrants. Followers of Arminius, who protested to the States of Holland 1610 against their condemnation as heretics by the Synod of Dort.

Remora. See DISCOCEPHALI.

Remsen, IRA, M.D., LL.D., b. 1846. Prof. Williams Coll. 1872–76, and Johns Hopkins Univ. since 1876; founder and ed. *American Chemical Journal*, 1879; author of five text-books on chemistry, several of which have been tr. in Europe and Asia.

Remus. See ROMULUS.

Rémusat, MME. CLAIRE ELISABETH JEANNE (GRAVIER DE VERGENNES), COMTESSE DE, 1780–1821, m. 1796. Lady-in-waiting on Empress Josephine. Her *Memoirs*, pub. in 3 vols., 1879–80, and *Letters*, 1881, have an important place in the history of Napoleon.—Her son, CHARLES FRANÇOIS MARIE, 1797–1875, held government posts, was exiled 1851, and wrote on *Abelard*, 1845; *St. Anselm*, 1853; *Bacon*, 1857; *Wesley*, 1870; and *Philosophy in England*, 1875.—His son, PAUL, 1831–1897, was a journalist, Deputy, and Senator.

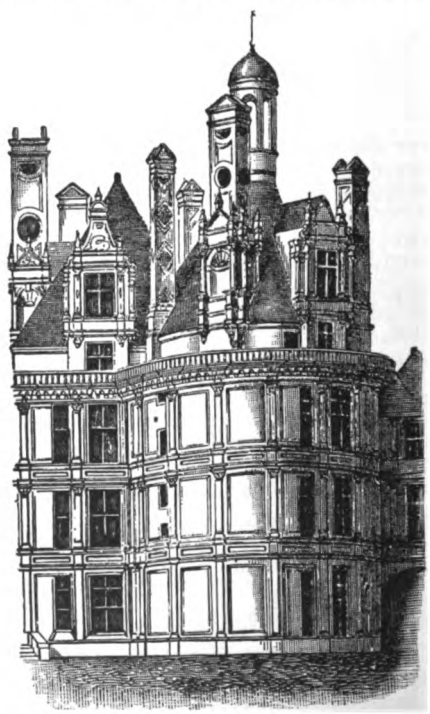
Rémusat, JEAN PIERRE ABEL, 1788–1832. Sinologist; prof. Coll. de France 1814. *Langues Tartares*, 1820; *Chinese Grammar*, 1822; *Melanges Asiatiques*, 4 vols., 1825–28.

Rémy, JULES, b. 1826. French traveler, chiefly in America. *Hawaii*, 1859–62; *Mormon Country*, tr. 1860.

Rémy, PAUL EDOUARD, 1711–1784. French historical writer.

Renaissance, or RENASCENCE. Revival of Art and Learning, dating, in Italy, from ab.1420; style of Architecture was introduced in France ab.1530, in England and Germany ab. 1550.

Renaissance Architecture. That which originated in Italy in the 15th century, and was an attempt to revive the modes of building of classical Rome. It is also known as the Revived Classic and sometimes simply as Modern Architecture,



Chateau of Chambord, France.

in contradistinction to the Mediæval Architecture which preceded it. All modern building which employs the classic orders, unless in direct reproduction or imitation of Greek or Roman buildings, is loosely called Renaissance. It was derived in

part from an actual inspection of the remains of ancient buildings and in part from the account of ancient methods of design given by Vitruvius. Its introduction was due to Alberti and Brunelleschi, and it was extended by Bramante, Palladio, Vognola, Serlio, Michelangelo and other Italians. In France the Renaissance took a special character, on account of the stronger tradition in that country of mediæval methods of design and workmanship, and at first consisted of little more than the addition of classic or classicized detail to Gothic buildings. In Germany, and in England also, the Italian Renaissance was much modified, becoming in England the style known as Elizabethan and subsequently Jacobean. Queen Anne is applied to the modification of Renaissance architecture practiced in England during the reign of that sovereign and indeed throughout the 18th century. An attempt was made in England and the U. S. ab. 1876 to revive the so-called style, especially for domestic purposes, but its vogue was short-lived.

Renal Diseases. A variety of diseases may attack the kidneys. Those most frequently thought of are the various forms of Bright's disease (characterized by the presence of albumen in the urine) and renal and nephritic colic, which is caused by the passage of a calculus from the kidney to the bladder.

Renal Portal System. Seen in the Frog, most reptiles, and some vertebrate embryos. In these a portion of the blood from the hind limbs passes through the kidney and joins the capillary system that transfers blood from the renal arteries to the renal veins, and thence to the postcava.

Renan, JOSEPH ERNEST, 1823–1892. French critic, Orientalist, and historian, eminent for learning, imagination, and descriptive power; educated as a Jesuit; prof. Hebrew Coll. de France 1860–62 and from 1870; Academician 1878. His chief work, *Hist. Origins of Christianity*, includes the famous *Life of Jesus*, 1863, which caused an immense sensation and called forth many answers; *The Apostles*, 1866; *St. Paul*, 1867; *Antichrist*, 1873; *The Gospels*, 1877; *The Church*, 1878; *Marcus Aurelius*, 1880; *Hist. People of Israel*, 4 vols., 1887–93. In these he attempts to reconstruct the sacred history with a free hand from scanty materials. Among his other works are *Recollections of Youth*, 1883; *Philosophic Dramas*, 1888; *Future of Science*, 1890. Most of his books have been tr., widely read, and have exerted great influence. Opinions vary as to the value of his teachings, but not as to his genius and style.

Renard, GUSTAVE HENRI, 1673–1741. French explorer of Central America, New Granada, and Guiana, 1718–24. *De naturalibus Antillorum*, 1739.

Renauld, CÉSAR AUGUSTE, 1701–1734. Negro poet of Martinique. *Romances et Mélodies*, 1761.

Renault, PHILIPPE FRANÇOIS, d. ab. 1750. French colonist in Illinois 1719–44; introducer of slaves from W. Indies. Traces of his settlement on the Mississippi, 15 m. n. of Kaskaskia, Ill., remain.

Rendel, SIR ALEXANDER MEADOWS, b. 1829. English civil engineer, active in India; constructor of many docks and railroads.

Rendel, GEORGE WHITWICK, b. 1832. English engineer, prominent in connection with ordnance.

Rene I., "THE GOOD," 1409–1480. Count of Provence; titular King of the Two Sicilies; patron of letters and art. *Works*, 4 vols., 1845.

Renegade. Deserter from military service; faithless to the principles of honor or to the obligations which have been freely assumed by him.

Reni, GUIDO. See GUIDO RENI.

Reniform. Leaves or other organs which are kidney-shaped in outline.

Renilla. See PENNATULIDÆ.

Rennell, JAMES, F.R.S., 1742–1830. English geographer, long in India; Surveyor-gen. of Bengal till 1777; father of oceanography. *Geog. of Africa*, 1792; *Geog. System of Herodotus*, 1800; *Plain of Troy*, 1814; *Expedition of Cyrus*, 1816; *Western Asia*, 1831; *Atlantic Currents*, 1832.

Rennes. City of France, at the junction of the rivers Ille and Vilaine; once capital of Brittany. It has a large trade and varied manufactures. Pop., 1891, 69.232.

Rennet. Digestive unorganized ferment found in the stomachs of the young of all mammals. It has the power of rendering the casein of milk insoluble, and is used to cause coagulation of milk in the process of cheese making. Commercial rennet is usually prepared from the stomachs of calves, though those of swine are sometimes used. The best rennets are now imported from Bavaria.

Rennet Stomach. See ABOMASUM.

Rennie, JOHN, 1761–1821. Civil engineer; first to use the steam engine to drive mill machinery, builder of the Plymouth breakwater and the Southwark bridge. His work was con-

John Rennie, the elder.

tinued and extended by his sons, GEORGE, 1791–1866, and SIR JOHN, F.R.S., 1794–1874, embracing public works of nearly every description. Sir John pub. *British and Foreign Harbors*, 1854; and *Autobiography*, 1875.

Reno, JESSE LEE, U.S.A., 1823–1862. Brig.-gen. U. S. Vols., 1861, Major-gen. 1862; killed at South Mountain, Va.

Reno, MARCUS A., U.S.A., 1835–1889. Major of cavalry, associated with Custer in the campaign against the Sioux 1876, but not engaged in the fatal battle of Little Big Horn.

Renouf, ÉMILE, b. 1845. French painter.

Renouf, PETER LEPAGE, b. 1824. English archæologist, noted chiefly for his writings on Egypt.

Rensselaerite. Variety of the mineral talc, found in considerable quantity in n. N. Y. and Canada, and evidently a product of the alteration of anhydrous magnesian silicates of the pyroxene type.

Rent. The remuneration received by the owners of land for the use of the native and indestructible powers of the soil; including pasture, timber lands, mineral deposits, water privileges, and building sites; at common law, definite profit issuing at stated intervals out of real property. The term has been modified by statute.

Rent, LAW OF. Rent exists because of the difference of the productiveness of different soils under cultivation at the same time for the supply of the same market: its amount in any given case is determined by the difference between the annual yield and that of the least productive land cultivated for the same market, other conditions being normal.

Renwick, JAMES, 1662–1688. Scottish martyr of the Covenant.

Renwick, JAMES, LL.D., 1790–1863. Prof. Columbia 1820–53. *Natural Philosophy*, 1822–23; *Steam Engine*, 1830; *Mechanics*, 1832–40.—His son, JAMES, 1818–1895, was the architect of Grace Ch., 1845, St. Patrick's Cathedral, 1858–79, and other notable buildings in New York.

Reordination. Catholic theology teaches the effect of true ordination to be indelible. The R.C. Ch. ignores, but has not decisively denied the validity of Anglican orders, and acknowledges all Oriental orders.

Repanel. See UNDULATE.

Repeated Stresses. Stresses applied at regular intervals, such as those caused by the passage of trains over a bridge. These produce molecular changes in the material if they approach the elastic limit in intensity. The factor of safety should be higher for repeated than for steady stresses.

Repentance. Sorrow for sin, issuing in turning from it; distinguished from remorse, which is merely emotional and ineffectual.

Repercussion of Taxes. Process by which indirect taxes are supposed to diffuse themselves evenly on the population, irrespective of the persons on whom they are originally laid.

Repetend. Sequence of figures which recur in regular order in a circulating decimal.

Rephaim. 1. Tribe e. of Jordan, repeatedly mentioned in O. T.; regarded as giants. 2. Spirits of the departed. 3. Valley s. of Jerusalem.

Rephidim. Scene of a defeat of Amalek by Israel, near Mt. Sinai, Ex. xvii.

Replenisher. Instrument devised by W. Thomson to be used in connection with his quadrant electrometer for keeping the Leyden jar connected with the suspended needle at a constant potential. It consists of two small metal plates, one at each end of an insulating bar. These may be brought in alternate contact with the two coatings of the jar: the arrangement is such that by rotating in one direction it raises the potential of the jar, but in the opposite direction it lowers it.

Replevin. Common-law action to recover specific goods; now regulated by statute.

Reports. Collections of judicial decisions. In English Law they begin with the Year Books, ab.1300.

Reposianus, 4th cent. Latin poet.

Repoussé. Ornamental metal work, formed in relief by striking up the metal from behind, with a punch or hammer

Repoussé Work.

until the required forms are roughly produced in relief upon the surface; the work is finished by chasing.

Representation. Idea or image of an object which stands for it when the object itself is not immediately present to the senses. We may thus mediately know an object by means of its image or representation, whereas in sense experience we know an object immediately by means of its presentation. Representation as a function depends upon a quality of consciousness called retentiveness, and further upon an activity called reproduction. A representation, therefore, is a reproduction of a past impression, which takes place according to the laws of ASSOCIATION (q.v.).

Representative Government. See DEMOCRACY.

Reprieve. Respite from penalty. Criminals under sentence of death may be granted a reprieve, upon doubt as to the justice of the conviction; to allow time for further investigation; or because the convict has become insane, or is pregnant.

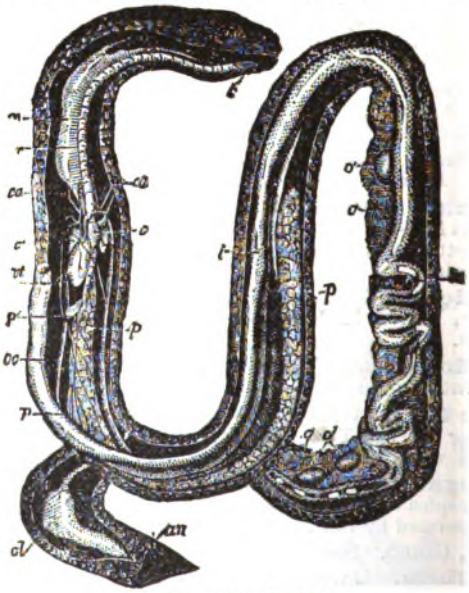
Reprisals. In International Law, seizing property of another nation and holding it, until the latter makes reparation for a wrong.

Reprobation. Supposed consignment of some, by divine decrees, to eternal death; opposed to Election.

Reproduction. In Biology, expression of the power living organisms have of separating a portion of the protoplasm of their bodies, which portion after growth and greater or less developmental change becomes like the parent. Usually two primary sorts of reproduction are distinguished, sexual and asexual. In the latter, the part set free may be a single cell, as in spores and parthenogenetic ova, or it may be a bud which includes all the tissues or else undifferentiated tissue, or the process may be effected by fission or splitting of the organism into two nearly equal parts. Each part then produces any lacking organs it may need to make it like the parent, which has disappeared as a separate existence, or, better, has become two new beings now recognized as its children. In sexual reproduction the separated protoplasm is always two cells (gametes) between which division of labor has been effected. One has taken the function of making more or less of food yolk for the early nutrition of the future embryo: this is the egg or ovum. The other (or sperm) has developed a special organ, the flagellum, by which it is enabled to find and penetrate the ovum: this process is known as fertilization. Essentially, this phenomenon consists in the union of the chromatin of the sperm cell with that of the egg-cell; just before union each exists as a pronucleus in the egg, and usually no difference is discernible between them. The result of fertilization or fecundation is a cell which contains protoplasm representing two different individuals, the father and mother, but also including the characteristics of the opposite sex latent in each parent. As this egg multiplies by fission during development, it follows that each cell of the offspring is a resultant of the union of two different natures. In case of alternation of generations, this nature is transferred into all the zoöids produced asexually. Comparing the complete history of reproductive and developmental processes among all plants and animals, all the varieties of reproduction are seen to conform to a simple formula: viz., first, growth of protoplasm by assimilation; second, its fission or separation into cells and zoöids, between which more or less division of labor may obtain; and third, at more or less regular intervals, the union of protoplasm of slightly different character into a single reproductive cell, producing a rejuvenating (?) effect that is transmitted for an indefinite period by asexual multiplication of cells, zoöids, etc. See AMPHIGENESIS, SPOROGENESIS, ARCHIGENESIS, BIOGENESIS, etc.—In Botany, any sexual process by means of which new individuals are produced through ova, sperm, or seeds, etc.

Reptantia (see also PROSOBRANCHIATA). Group of *Streptoneura*, including forms having the foot well developed as a creeping organ. In the *Holochlamyda* the lip of the shell is unnotched. In the *Siphonochlamyda*, which includes marine forms with operculum and the mouth on a proboscis as in Conchs, the lip of the shell is notched to lodge a siphon produced upon the margin of the mantle. In the terrestrial *Pneumochlamyda* the pallial chamber is modified into a lung-sac, the mouth is borne on a rostrum, and a gill is absent. These forms are often included with the Pulmonates.

Reptilia. Scaly, or armored, cold-blooded Vertebrates with exclusively pulmonary respiration and incomplete separation of the ventricular cavities in the heart. The embryos have amnion and allantois. Snakes, Lizards, Tortoises and Crocodiles are included. Thus there is great diversity as to form, development of limbs, etc., but ribs are generally present and numerous; there is one occipital condyle; a basisphenoid bone is present (in place of the parasphenoid); and the



Anatomy of a Serpent.

t, tongue and glottis; *œ*, œsophagus (partly removed to show heart, etc.); *tr*, trachea; *ca*, *ca*, carotid arteries; *c*, left auricle; *c'*, right auricle; *vt*, ventricle of heart; *vc*, vena cava inferior; *p*, *p*, principal lung; *p'*, rudimentary lung; *i*, stomach; *int*, intestines; *cl*, cloaca; *an*, anus; *o*, ovary; *o o'*, ova.

reproduction, as in Birds, is oviparous (with few exceptions); but, except with some Pythons, the eggs are left to hatch of themselves. The males are furnished with intromittent organs. Many Reptiles pass the winter hibernating, while tropical forms suffer æstivation, or summer-sleep, during the dry season. They can exist a long time without food, and with limited respiration. The living species number 3,400. There are three sub-classes, *Lepidosauria* (Snakes and Lizards), *Hydrosauria* (Crocodiles), and *Chelonia* (Turtles), and several orders of fossil Reptiles. See LACERTILIA, DINOSAURIA, and ARCHOSAURIA.

Republic. Form of government in which the sovereign power is confided to, and immediately exercised by representatives and officers chosen by popular will.

Republican Party. Term first applied in American politics to the anti-Federalists, the Federalists advocating a strong central government, the Republicans favoring the sovereignty of the States and the rights of the people. During the War of 1812, the Republicans were stigmatized by their opponents as Democrats. The Federalists adopted the name National Republicans, and afterward that of Whigs. The present Republican party came into existence in 1856, and grew up mainly out of the elements opposing slavery and secession. It was the party of Union and Freedom during the Civil War, and has continued in power for the greater part of the time since. Its present tendencies are toward a strong centralized government and the advocacy of a high protective tariff. See DEMOCRAT.

Repudiation. Disowning of national debts, in whole or part, as by sundry States after the panic of 1837 and the war of 1861–65. The partial operation has been called readjustment. Such action destroys for a time the credit of the state or nation.

Repulsion. See FORCE.

Repulsive Crystal. See NEGATIVE CRYSTAL.

Reputation, RIGHT OF. Moral and legal right to have one's good name protected from the results of malicious or slanderous words spoken or published.

Requiem Mass. R. C. mass for the dead, so called from the beginning of the introit. It omits the *Gloria* and *Credo* of the ordinary missal text, and in musical settings, of which the most famous are those of Mozart and Cherubini, it generally has the following sub-divisions: Introit, *Kyrie*, Graduale (with the tractus *Absolve* and the sequence *Dies iræ*); Offertory, *Domine Jesu Christe; Sanctus*, and *Benedictus* with the Communion *Lux æterna*. See MASS.

Requisitions. Formal demands by one government upon another for a criminal, or for military supplies.

Reredos. Wall or screen at the back of an altar or chancel, usually ornamented with paneling, sometimes with pinnacles,

Reredos of St. Paul's Cathedral, London.

niches and statues, and brilliantly painted.—Also the iron plate in the open fireplace in 15th century.

Resaca. Village in Gordon co., Ga., scene of a Union victory May 14–15, 1864.

Resaca de la Palma. In s.e. Texas; scene of Gen. Taylor's victory over a superior Mexican force May 9, 1846.

Resaw. Machine for cutting thin boards from thick plank, with least loss of wood in kerf and sawdust. It is not advisable to saw lumber thin at the forest mills, because of the action of sun and water on thin stuff, and the danger to tools from the grit which all lumber acquires on its surface in transit to factories. Resawing is best done by a band saw which can have a very thin blade and hence entail small loss in kerf spaces. It is also done by circular saws, either segmental or with a heavy flange on one side to admit of very thin gauge of steel for the blade. Less desirable is the reciprocating resaw, which is slower. The lumber is fed on edge by vertical feeding rolls to the saw.

Rescission. Abrogation of a contract, either by act of the parties to it, or by judicial decree.

Rescripts. Declarations on points of law by emperors and popes, answering inquiries; important in the Middle Ages.

Resedaceæ. Natural family of flowering plants of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising 6 genera and ab.50 species of herbs, distributed throughout Europe, w. and middle Asia, n. and s. Africa; called the Mignonette family.

Resentment. Natural repulsion or sentiment of anger awakened by an attack or show of hostility toward us.

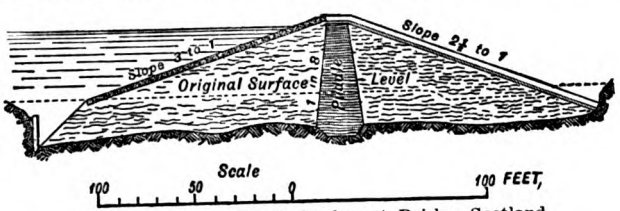
Reservation, MENTAL. Keeping back some essential portion of a statement; *e.g.*, "I do not know (officially)"; practice justified by some Jesuits, and denounced by Pascal in his *Provincial Letters*, 1656.

Reservation, MILITARY. Land set aside from the public domain for military purposes, such as for the erection of fortifications, the establishment of the Military Academy, etc.: or this land may be ceded by a State to the general government for military purposes.

Reservations, PAPAL. Right of appointment to benefices, claimed by the popes in certain cases, as (1265) when the incumbent died in Rome or (1286) made his resignation to the pope.

Reserve, ARMY. Portion of the army held in reserve to strengthen the main line, to retrieve disaster or to decide victory at the supreme moment: generally composed of tried and experienced soldiers not easily affected by panic.

Reservoir. Artificial basin for collecting, storing, or distributing water. The earliest were those built in Egypt and India for irrigating purposes, earthen embankments being universally used. There are now in India 40,000 reservoirs, one of which has a dam 30 m. long and a storage area of 60 sq. m. In the U. S. many reservoirs are built with rock-fill dams and with solid masonry dams, one in California being 176 ft. high. The collecting reservoirs of the Croton water supply for New York have a total capacity of 15,000 million gallons. Distributing reservoirs are usually built on hillsides rather



Nethertrees Reservoir Embankment, Paisley, Scotland.

than by impounding streams, and puddle bottoms are made to prevent leakage; the new one in Central Park, New York, holds 1,500 million gallons. Distributing reservoirs allow opportunity for the purification of water by sedimentation and aeration, and may be cleaned more easily than collecting reservoirs. Failures of embankments have resulted in great destruction of life and property; notable failures are those of the Dale Dyke dam near Sheffield, Eng., 1861; of one at Williamsburg, Mass., 1874; and of the South Fork dam at Johnstown, Pa., 1889. See JOHNSTOWN, FLOODS, and DAMS.

Reshid Pasha, 1802–1858. Turkish Foreign Minister 1839–41; Vizier 1846–52 and 1853–56.

Residence. One's fixed place of habitation; generally synonymous with domicile, but often a more transient place of abode.

Residence OF CLERGY IN THEIR BENEFICES. Required by Councils of Nice, 325, and Antioch, 341; disregarded by pluralists and others in most ages. The evils of non-residence were vainly attacked by the Council of Trent, and existed in England, Sweden, and elsewhere, till 1800 or later, many regarding their posts as sinecures.

Residual Charge. Phenomenon frequently observed in Leyden jars or electric condensers. When a jar previously charged is discharged and then allowed to stand a short time, it exhibits a second charge comparatively feeble, which is called the residual charge or electric residue. The magnitude of this depends upon the initial charge, the thickness and nature of the dielectric, and the interval of time between the charging and discharging. The phenomenon is due to electric absorption.

Residual Magnetism. When the exciting current of an electromagnet is interrupted, the demagnetization is not complete, especially when the magnetic circuit is closed. The remaining magnetization, or residual magnetism, is often strong enough to hold the armature in contact, unless a powerful opposing spring is employed. This fact is of great value in practice in a dynamo electric machine, since the residual magnetism starts the initial current.

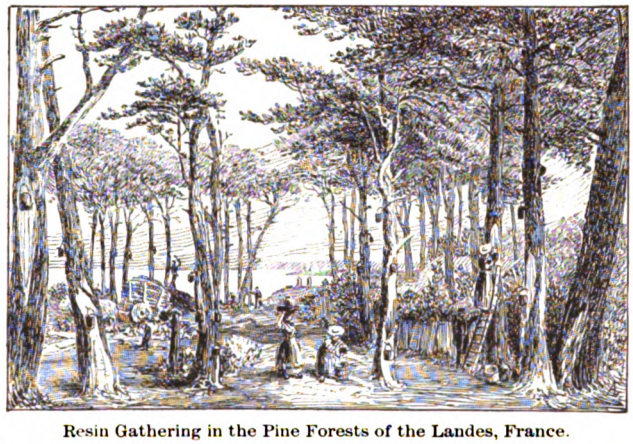
Resilience. Physical property of materials of construction, whose presence or absence fits or unfits it for use in springs. It is proportional to the work required to stretch the piece, when undergoing a test, to the point at which the deformations become irregular under constant increment of load (see ELASTIC LIMIT). It is calculated for any material by multiplying the alteration in length up to that point by the mean load which has acted up to that limit of strain.

Resin-Cells. Specialized cells containing resinous substances. They are of various forms, and are found in the parenchyma of numerous plants.

Resin-Opal. See OPAL.

Resinous. See ELECTRIFICATION.

Resins. Vitreous gums which appear as exudations upon trees, either as free resins or as resins mixed with or dissolved in hydrocarbons. They are mixtures of organic acids, and dissolve in alcohol and alkalies. Tolu balsam, copal, lac, and turpentine are examples. Mineral resins occur in a great variety of form and composition, and in very many localities, especially in connection with brown coal or bituminous coal. They are usually classed with the oxygenated hydrocarbons which,



Resin Gathering in the Pine Forests of the Landes, France.

primarily of vegetable origin, have assumed a mineral character under the action of natural causes. Amber and asphalt are examples. Solutions of resins in alcohol, oil of turpentine, and drying oils furnish varnishes. The gum-resins are the dried juices of certain plants; they are mixtures of gum and resin, the former soluble in water, the latter in alcohol. They are used in medicine or perfumery. Asafetida, gamboge, and myrrh are examples.

Resistance. That passive agent on account of which it is necessary to apply force to produce momentum. Friction is the most important resistance in mechanics. When an electric current passes through a wire, it is said to experience resistance. In this case the resistance is the energy through which the electric energy is transformed into some other form of energy; *e.g.*, heat and light. The specific resistance of a substance is the reciprocal of its specific conductivity, *i.e.*; the resistance of a cube 1 centimeter square and 1 centimeter long.

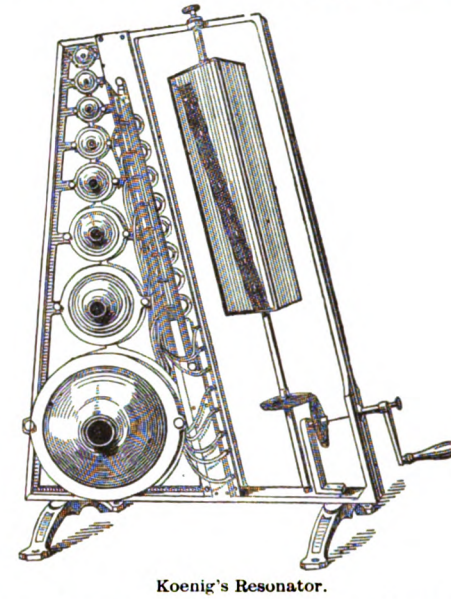
Resistance of Materials. Science which treats of the strength of materials and their behavior under stresses. It includes elastic resistances, where the material springs back to its original form, and the ultimate resistances which accompany rupture. The first investigations were made by Galileo 1638 on the resistance of beams. Hooke in 1678 stated the first law of elastic resistance; modern experimental researches begin with the work of Hodgkinson and Tredgold ab.1810.

Resistivity. Specific RESISTANCE (q.v.).

Res Judicata. A matter adjudged; meaning that the subject matter of an action has already been acted upon by the court, and hence cannot be used as a ground of action again.

Resolution. Process of ascertaining the structural elements of an expression. A quantity is resolved into its factors. Solution seeks specific values from an equation; resolution seeks interrelated elements.

Resonance. The re-enforcement of sounds by the sympathetic vibrations of bodies in the vicinity. The note produced by a tuning fork is often strengthened by mounting it on a box of the proper size and shape containing a column of air. In this case the column of air is called a resonator. Helmholtz made use of the principle of sympathetic vibration in



Koenig's Resonator.

the construction of a set of resonators in the form of brass globes open at the opposite ends of a diameter. These globes are of different sizes and are accurately tuned to respond to notes of known pitch. By their means a very complex sound may be analyzed, each component causing the air in the corresponding resonator to vibrate and produce a sound.

Resonator. See RESONANCE.

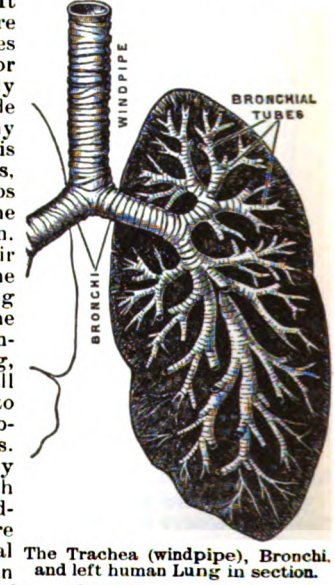
Resorcin. $C_6H_4(OH)_2$. Metadihydroxybenzene; first prepared by fusing gums with potash; now prepared on a large scale by fusing the benzenedisulphonic acids with sodium hydroxide. It is a white crystalline solid, mpt. 119°C., and is used in pharmacy and in the preparation of dye-stuffs.

Resorcin Blue. $C_{12}H_9NO_4$.? Produced by heating resorcin with sodium nitrite; violet solid, soluble in water. It turns red with acids, and is used as an indicator under the name of lacmoid.

Resorcin Brown. $C_{20}H_{17}N_4O_9SNa$. Brown dye-stuff, produced by the action of the diazo compound of xylidine on tropäoline O; soluble in water.

Resorcin Phthalein. See FLUORESCEINE.

Respiration, ORGANS OF. The apparatus employed in the process of breathing. It is simplest in insects, where it is merely a series of tubes branching through the interior of the body, opening externally by small openings along the side of the body. In fishes and many marine animals the process is carried on by means of the gills, which are delicate tufts or combs of membrane so situated that the water has free access to them. The gills make use of the air dissolved in the water. The apparatus for the air-breathing vertebrates are the lungs. The lungs are spongy-like bodies inclosed in the thorax, consisting, essentially, of a number of small cavities having free access to the outer air, being minute subdivisions of the bronchial tubes. These cavities are bounded by thin, elastic walls, over which are spread the capillary blood-vessels. These air-chambers are $\frac{1}{100}$ in. diameter, and their total number in the lungs of a man 725 millions, with a total surface of 2,000 sq. ft. By the expansion of the thorax, the outer air is drawn into the lungs (inspiration), where some of the oxygen is absorbed



The Trachea (windpipe), Bronchi, and left human Lung in section.

by the blood vessels and carbonic anhydride and some other substances given off. The contraction of the thorax (expiration) expels the vitiated air. The oxygen is carried by the blood to all parts of the body and is given up to the body at all points. The tissues give to the blood carbonic anhydride, urea, water and other blood products and the blood returns to the lungs to be oxygenized again. The inspired air contains 21 parts oxygen, 79 nitrogen, 0.03 carbonic anhydride. The expired air contains 15 to 16 parts oxygen, 79 nitrogen, and 4.7 carbonic anhydride. The amount of air passing through the lungs in 24 hours is variable, depending upon habits and bodily condition; it has been estimated to be from 466 to 908 cu. ft. The water given off in the same time amounts to 11 oz., and the carbonic anhydride from 7.1 to 11.7 oz. The number of respirations of a healthy adult is 16 to 20 per minute, and the amount of air at each inspiration 20 cu. in., which may be forced to 120 cu. in. The total capacity of the respiratory organs is 230 cu. in. See BLOOD, CIRCULATION OF THE BLOOD, and HEART.

Respiratory Sounds. The various sounds produced by the respiratory organs in the processes of breathing. They are made use of in that form of physical diagnosis called AUSCULTATION (q.v.). See also RALES.

Respiratory Trees. Two tree-like, hollow, gill-like organs, attached to the cloaca of Holothurians, which water is alternately drawn into and expelled from.

Respond. Half-column attached to the wall at the end of a series of free standing columns forming an arcade.

Respondentia. Loan of money for which a ship's cargo or a part thereof is hypothecated, but is hazarded on the safe arrival of the ship. The contract is usually in the form of a bond.

Rest. One point is said to be relatively at rest with respect to another when the straight line joining them has a constant length and direction. We have no conception of absolute rest, as we know of no point of reference fixed in space.

Rest Cure. Method of treatment devised by Dr. S. Weir Mitchell, of Philadelphia, for certain classes of patients having abnormal conditions of the nervous system; *e.g.*, neurasthenia and certain forms of hysteria. It includes rest, isolation, systematic feeding, massage, and electricity.

Restiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 20 genera and ab. 240 species, natives of s.w. Africa and Australia.

Restif de la Bretonne, NICOLAS EDMOND, 1734–1806. French novelist, author of some 200 volumes.

Restigouche. River of Quebec and New Brunswick, noted for its salmon. Length ab. 200 m.

Resting-Spore. Spore which takes on a thick cell-wall and does not germinate for a considerable time.

Resting Stage OF NUCLEI. Period intervening between the times of nuclear activity during cell-division. In the latter the chromatin granules are concentrated into definite bodies; in the resting stage they are scattered throughout the nuclear sap as much as possible, suggesting that in this stage the processes of nutrition and granular reproduction take place.

Restitution, EDICT OF. March 6, 1629, by Ferdinand II., ordering all the property of the R. C. Ch. acquired or secularized since the peace of Passau 1552, to be restored.

Restitution Pressure. See COEFFICIENT OF RESTITUTION.

Restoration. By the accession of Charles II. to the throne of Gt. Britain, May 29, 1660, monarchial government was restored after eleven years of republican rule, which followed the death of Charles I., beheaded Jan. 30, 1649. It was a festival of the Church of England till 1859.

Restoration. Doctrine held by Origen, and now by many, which substitutes temporary punishment and probation hereafter for an endless hell; sometimes called "the larger hope."

Restraint of Trade. Evil which was supposed to give its criminality to a conspiracy to raise the rate of wages, in English common law.

Restrepo, JOSÉ MANUEL, 1780–ab.1860. Historian of the Colombian Revolution, 1827.

Restriction, IN ECONOMIC HISTORY. Permission or requirement imposed by government on the Bank of England, 1797–1821, to refuse to redeem its notes in coin.

Resultant. Determinant the elements of which are the coefficients of the variables in "n" homogeneous equations of "n" variables. It must equal zero if the equations are simultaneous.

Resultant. Any directed physical quantity which is equivalent in effect to two or more similar quantities is called their resultant, and these quantities are called components; *e.g*, the resultant of two or more forces is that force which can replace them and can produce the same effect.

Resultant Tone. See COMBINATIONAL TONE.

Resumption. Return to a par of value between gold or silver coin and a previously inconvertible paper money, accomplished by the U. S. for its legal tender notes 1879.

Resupinate. In Botany, inverted organs.

Resurrection. Return to life of the human body and spirit, in ways necessarily unknown; subject of much vain speculation; matter of faith, based on the recorded rising and promise of Christ.

Resurrection, CONGREGATION OF THE. Society, founded by Rev. J. Kajsiewicz in 1836 at Rome, consisting of R. C. priests. A few missions are in the U. S.

Resurrection Plant. In Cal. and Arizona, *Selaginella lepidophylla*, which curls up into a round ball when dry, but expands when wet; also *Anastetica hierochuntia*, a plant of the *Cruciferæ*, native of Arabia and Syria, which has a similar habit, and is known also as Rose of Jericho.

Rose of Jericho.

Resuscitation. Restoration of suspended respiration to one apparently dead from suffocation. The effort is made to inflate the lungs with air, then to empty them in a rhythmical manner, simulating the respiratory process. The person is placed upon his back, with a roll of clothing under it, and hand pressure applied to both sides of the chest between the short ribs, with sudden release, and repeated five times a minute, increasing to twelve. In another method the elbows are elevated outwardly two seconds, then depressed to the sides the same time, fourteen times a minute. These efforts should be prolonged two hours. After breathing is natural, give stimulants and keep warm.

Retained Pay. The U. S. government retains one dollar per month of the pay of a re-enlisted soldier until his discharge from this re-enlistment. It is subject to forfeiture for desertion and unless he serves honestly and faithfully to the time of his discharge: retained pay draws interest at the rate of 4 per cent.

Retaining Wall. One nearly vertical and subject to the pressure of earth against its back. The top should be 2 ft. thick, and the thickness of the base should be about four-tenths of the height, in order to secure proper stability. Retaining walls fail either by sliding on the base or by overturning, the latter being the more liable to occur.

Retardation OF THE EARTH'S ROTATION. Theoretically, the tidal waves must act as a break upon the earth to diminish its angular velocity. There are some indications that this diminution has reached an appreciable value, but it is still undecided.

Rete Mirabile. Net formed by the breaking up of an artery into branches and reuniting into an arterial trunk again. More particularly the network formed by the intercranial portion of the internal carotid artery of some animals.

Retene. $C_{18}H_{18}$. Solid hydrocarbon, found in the high-boiling oils obtained by the distillation of coal tar.

Retention of Urine. Inability to empty the bladder voluntarily. It may be due to obstruction (as a stone in the bladder), a spasm of the muscles employed, or their paralysis. It may be caused by the prolonged voluntary retention of the urine and overdistention of the bladder. A warm hip bath, or the application of cloths wrung out of hot water over the distended bladder and to the perineum will often bring relief. Failing this, the services of a surgeon will be required.

Retentivity. See SATURATION POINT.

Rethel, ALFRED, 1816–1859. German painter.

Reticle of Telescope. This consists ordinarily of a number of spider webs placed in the common focus of the ob-

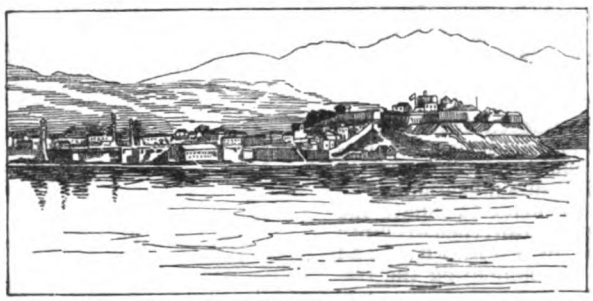
ject glass and eye-piece, forming fine sharp lines, over which the transits of stars or other bodies may be observed. Sometimes lines ruled on glass are used instead.

Reticularia. Marine Rhizopods or FORAMINIFERA (q.v.) proper. They have usually a calcareous, perforated shell with one chamber (*Monothalamia*), or several chambers (*Folythalamia*). They may be perforate or imperforate, and they have slender anastomosing pseudopodia.

Reticulate Veined. Leaves in which the veins anastomose so as to form a network, as in most dicotyledonous plants.

Reticulum. 1. Special network of protoplasmic fibrillæ in cells and nuclei. 2. Second chamber in the stomach of a ruminating or cud-chewing animal. In this the wall is lined with compartments, into which the food from the paunch is pressed and molded into pellets or cuds, which are regurgitated to be more thoroughly chewed.—In Botany, fibrous membrane at base of palm-leaves.

Retimo. The ancient Rhithymna; seaport of Turkey, on the n. coast of the Isle of Crete, 38 m. w. of Candia. The



Retimo, seen from the Anchorage.

citadel is in ruins and the port is full of sand banks. Its bazaars and streets have a Turkish appearance. Pop. 9,100.

Retina. Innermost coating of the eye, composed essentially of the net-like expansion of the optic nerve. It is here that the light motion is transposed into nervous energy, which, being carried to the visual center of the brain, gives the sensation of vision. See EYE.

Retinacula. Lateral retractor muscles of the proboscis of the *Acanthocephala*.

Retinaculum. System of hooks that hold the anterior and posterior wings together by their edges in certain moths. —In Botany, one of the arms supporting the pollen-masses in Milkweeds and Orchids.

Retinalite. Variety of massive serpentine, found in Canada, and having a resinous luster.

Retinophoræ. See OMMATIDIUM.

Retinulæ. Nerve-rods, made up of several elongated cells placed side by side behind the crystalline cones in compound eyes. See OMMATIDIUM.

Retinulate Eye. One having retinulæ. It may be monomeniscous (central eye of *Limulus*), or polymeniscous (lateral eyes of *Limulus*, compound eyes of insects, etc.). Each sort may again be either monostichous or diplostichous.

Retro-Choir, or BACK CHOIR. In Gothic Architecture, the space between the back of the high altar and the wall of the chancel, or the chapel at the rear of the church.

Retired List. In U. S. Army Register there are published lists of officers retired from active service: an unlimited list comprising mainly those who have passed beyond 64 years of age, and a limited list, 350 in number, of those who have been retired from various causes incident to the service: when those on the limited list reach 64 years of age they are transferred to the unlimited list. At present, 1897, there are 647 officers and 1,034 men upon the retired list.

Retirement. The honorable cessation of the active military service of an officer or soldier by reason of reaching the legal age, or on account of sickness, wounds or other cause incident to faithful service. In U. S. army, soldiers are retired on their own application after 30 years' active service. When an officer has served 40 years either as an officer or soldier in the regular or volunteer service or both, he shall, if he makes application therefor to the President, be retired. When he has served 30 years or is 62 years of age he may be retired at the discretion of the President; when he becomes 64 years of age his retirement is compulsory. Retired pay is 75 per cent of the pay of the actual rank held by the officer or soldier. Retired officers are withdrawn from command and line of promotion, but are subject to the rules and articles of war, and to trial by court-martial. An officer may be wholly retired and thus cease his connection with the military service, upon the recommendation of an Army Retiring Board, approved by the War Department: in this case one year's pay and allowances are granted him.

Retitelariæ (INÆQUITELÆ). See SPIDERS.

Retort. Vessel made of glass, earthenware, or metal, in which distillation is effected by means of heat.

Retreat. Time or place of brief retirement for religious exercises; long observed in R. C. Ch., and of late by Anglicans.

Retreat of the Ten Thousand. Return of Greek mercenaries in Cyrus' army after the battle of Cunaxa, along the Tigris and through Armenia to Trapezus (Trebizond) on the Black Sea. The story is told by Xenophon, who was one of the officers.

Retriever. Dog that is trained to seek out and bring in game that is shot; there are two breeds, crosses with the Newfoundland, the wavy-coated with the setter, and the curly-coated with the spaniel or poodle. Attention was paid to these breeds ab.1850.

Retrograde Motion of Planets. The planets appear at certain times to move backward among the stars. This motion is only apparent, and is caused by the composition of the planet's motion with that of the earth.

Retrogressive Development, or RETROGRESSIVE METAMORPHOSES. The ontogeny of organisms that have become degraded through a secondary habit of parasitism, which habit has rendered the presence of locomotor, prehensile, digestive, etc., organs unnecessary; so these organs, present in the larva, become lost in the later stages of development. The law governing this change is similar to that by which these organs were acquired; ontogenetically, such change is to be looked on as a progress, as more involved and complicated, the life-history passing beyond that of the larval form, which, if no cenogenetic changes have occurred, represents the state of development of the ancestors. Should an individual fail to undergo this retrogressive metamorphosis but retain the more perfect organs of the larva, it would be a case of atavism or reversion.

Retting. Process to which the stems of flax are subjected to facilitate the separation of the woody part from the useful fiber. This consists in the fermentation of the resinous matter present in the plant, by exposing it to the weather for a considerable time; or by soaking it in soft water for 10 to 14 days; the former is practiced in Russia and the latter elsewhere.

Returned-Letter Office. See DEAD-LETTER OFFICE.

Retuse. Leaves or other organs with a rounded but notched apex.

Retz, or **Rais,** GILLES DE, 1396–1440. Marshal of France; executed for many murders and other crimes.

Retz, JEAN FRANÇOIS PAUL D' GONDI, 1614–1679. French intriguer, coadjutor to Abp. of Paris 1643; Cardinal 1651; imprisoned by Mazarin 1652, in exile 1654–62; Abbot of St. Denis 1662. His *Memoirs*, pub. 1717, extend to 1655.

Retzius, ANDERS JOHAN, 1742–1821. Prof. Lund 1777. *Floræ Scandinaviæ Prodromus*, 1779; *De plantis cibariis Romanorum*, 1808; *Flora Virgiliana*, 1809.

Retzius, MAGNUS GUSTAV. b. 1842. Swedish anthropologist.

Retzsch, FRIEDRICH AUGUST MORITZ, 1779–1857. German artist, whose highly poetical outline illustrations of Goethe's *Faust*, Schiller's *Song of the Bell*, Burger's ballads, some plays of Shakespeare, etc., are widely known. In this field he had many imitators but no equal.

Reuben. Eldest son of the patriarch Jacob; ancestor of one of the twelve tribes of Israel.

Reuchlin, or **Capnio,** JOHANN, 1455–1522. German humanist, promoter of Hebrew and Greek study; uncle of Melanchthon; prof. Ingolstadt 1520; accused of heresy and persecuted by Dominicans. Among his works are a Latin lexicon, 1476, a satirical play, *Sergius*, ab.1495, and a Hebrew grammar, 1506.

Reumont, ALFRED VON, 1808–1887. German writer on Italy. *Lorenzo de' Medici*, tr. 1876.

Reunion. Island 350 m. e. of Madagascar; discovered 1545; held by France since 1649, except 1810–15; called Ile de Bourbon till 1793. Area 970 sq. m., pop. ab. 180,000. Capital St. Denis, on n. coast.

Reuss, AUGUST EMANUEL, RITTER VON, 1811–1873. Prof. of Mineralogy in Vienna, and distinguished as a paleontologist.

Reuss, ÉDOUARD GUILLAUME EUGÈNE, D.D., Ph.D., LL.D., 1804–1891. Prof. Strassburg 1834–88; historian of N. T. 1842, tr. 1874; O. T. 1881; *Theology in Apostolic Age*, 1852, tr. 1872, and *Canon of Scripture*, 1862, tr. 1884; editor of Calvin's works.

Reuss, FRANZ AMBROSIUS, 1761–1830. German mineralogist and geologist. His special field of study was in Bohemia. *Lehrbuch der Mineralogie*, 3 vols., 1801–6.

Reuss Greiz AND **Reuss Schleiz.** Two principalities of central Germany, n. of Bavaria. Area of former 123 sq. m.; pop., 1890, 62,754. Area of Schleiz 320 sq. m.; pop., 1890, 119,811.

Reuter, FRITZ, 1810–1874. Low-German humorist, novelist, and poet, imprisoned 1833–40. *Lauschen un Primels*, 1853–58; *Ut mine Stromtid*, 1862–64; *In the Year '13*, 1860, tr. 1873; *Seed-time and Harvest; Works*, 15 vols., 1863–75.

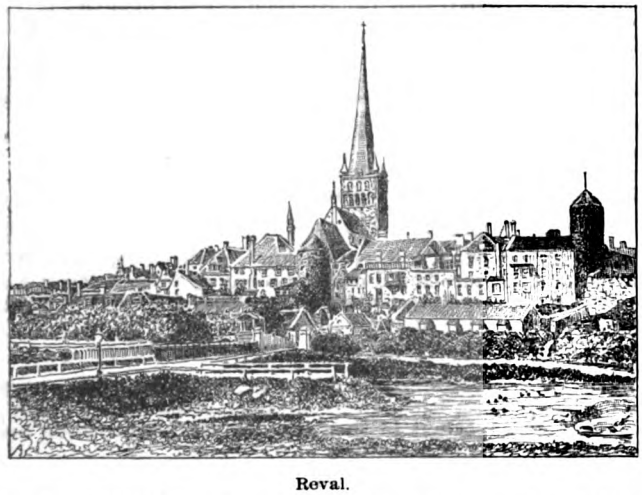
Reuter, HERMANN FERDINAND, D.D., Ph.D., 1817–1889. Prof. at Breslau 1855, Griefswald 1866, and Göttingen 1876. *Middle Ages*, 1875–77.

Reuter, PAUL JULIUS, BARON, b. 1821. Organizer of a news agency at Aix 1849, removed to London 1851, and since greatly expanded; constructor of submarine cables and telegraph lines.

Reuterdahl, HENRIK, 1795–1870. Abp. of Upsala 1856. *Swedish Ch. Hist.*, 5 vols., 1838–63.

Reutlingen. Old town of Würtemberg, 20 m. s. of Stuttgart; long a free city of the empire. Pop., 1890, 18,542.

Reval, or REVEL. Russian seaport, on s. shore of Gulf of Finland; founded 1219; one of the Hanse towns; held by



Reval.

Sweden 1561–1710. The town and castle were founded by Waldemar II. of Denmark 1218. Pop., 1890, 52,404.

Reveal. Vertical side of an aperture between the front of the wall and of the window or door frame.

Reveille. The drum beat and gun fire which announces the beginning of the official day at military posts.

Revelation. See BIBLE and INSPIRATION.

Revelation. Last N. T. book, describing visions, probably of St. John, when in exile in Patmos, ab. 68 or 96. The authorship is disputed.

Revenue. Income of a state or nation derived from taxes, duties and other sources for public use; properly applicable to expenses of government.

Reverberatory Furnace. See FURNACES.

Revere, PAUL, 1735–1818. Engraver of Boston, whose memorable midnight ride, April 18, 1775, to Concord and Lexington, to warn the people of the approach of the British, was made famous by Longfellow.—Three of his grandsons served in the Civil War: JOSEPH WARREN, 1812–1880, was Brig.-gen. U. S. Vols. 1862–63; Col. PAUL JOSEPH, 1832–63, was killed at Gettysburg.

Reverend. Honorary title usually allowed clergymen. In English Ch. and P.E.Ch., bishops are "Right Rev." "Very Rev." indicates a dean, or a moderator in Scotland; "Most Rev." an Abp.

Reversible Pendulum. Any compound pendulum so constructed that it can be suspended also from its center of oscillation.

Reversing Layer OF SOLAR ATMOSPHERE. Comparatively thin layer above the photosphere, where the dark lines of the solar spectrum are changed to bright ones. The observation is possible only at time of a total eclipse, and, although there seems to be good authority for the reality of this layer, its existence is doubted by some, particularly Lockyer.

Reversion. Operation in Mathematics similar to the exchange of subject for predicate. Given a quantity ($=y$) equal to certain combinations dependent on a second quantity ($=x$); reversion gives the second (x) as equal to certain combinations of the first (y).

Reversion. In Biology, occurrence of an organ or organism in an ancestral form. See RETROGRESSIVE DEVELOPMENT.

Reville, ALBERT, D.D., b. 1826. French Protestant; pastor at Rotterdam 1851–72; Professor Hist. Religions, Coll. de France, 1880. *Philosophy and Religion*, 1859, tr. 1864; *Deity of Jesus*, 1869, tr. 1870; *History of Religions*, 4 vols., 1883–88.

Revised Version OF THE BIBLE. Begun in England 1870, and in the U. S. 1871, by two committees: N. T. pub. 1881, O. T. 1885. Though a great improvement, it has by no means supplanted the version of 1611, which holds its place by force of long association.

Revival. Religious awakening, whether general or local. Such occurred in England under the Wesleys and Whitefield from 1739, and later in America. Methodism has always aimed at these results through camp-meetings and continued special services: the Salvation Army employs similar methods.

Revival of Letters. In s., central, and w. Europe, in 15th century; stimulated by Eastern scholars, who carried Greek literature with them from Constantinople.

Revolt. An act of rebellion against the constituted government by which allegiance to its authority is renounced.

Revolute. Method of vernation where the leaf is rolled up from both margins on the lower surface, as in *Rhododendron*.

Revolutions. The American Revolution may be dated from 1765, the war lasting 1775–83. English revolutions occurred 1649 and 1688; French 1789, 1830, 1848, 1871; Hungarian 1848; Italian 1859; in Rome 1798, 1848. See REBELLION.

Revolver. Weapon for personal defense at distances not greater than 60 yards, employed principally by officers and mounted troops. The Colt's double-action revolvers, caliber 0.38 in. and 0.45 in., are adopted for the U. S. service. In this the breech revolves automatically after each discharge so as to bring a new charge to the barrel; it may be used as a single action or self-cocking piece at the will of the firer.

Revue des Deux Mondes. Foremost of literary periodicals; issued fortnightly in Paris since 1829; conducted 1831–77 by François Buloz, and since by his son Charles.

Reward. Offer of compensation to any one who performs a prescribed act. Doing the act with knowledge of the offer binds the offerer to pay the reward.

Reybaud, MARIE ROCH LOUIS, 1799–1879. French writer, chiefly on economic subjects; Academician 1850. *Modern Socialists*, 1840–43; *Jerome Paturot*, 1843–48.

Reyer, LOUIS ÉTIENNE ERNEST, b. 1823. French composer of operas. *Salammbo*, 1893.

Reykjavik. Capital of Iceland; founded 874 on s.w. coast. Pop. ab. 1,500.

Reynard the Fox. Satiric fable of dubious origin, which received gradual accretions till it grew into a kind of epic ab.1150; long popular in Germany in one or another ver-

sion; tr. by Caxton 1481. One of the earliest versions was written in Low German by Hinreck van Alckmer, thought to be the pseudonym of Hermann Barkhusen, a printer of Rostock; it was printed at Lübeck 1498. The substance of it was derived from Flemish sources.

Reynolds, ELMER ROBERT. b. 1846. American ethnologist.

Reynolds, HENRY ROBERT, D.D., b. 1825. President of Cheshunt Coll. 1860; ed. *Quarterly Review*, 1866–74. *Athanasius*, 1889.

Reynolds, or **Rainolds,** JOHN, D.D., 1549–1607. Puritan leader; Dean of Lincoln 1593–98; proposer of the Bible version made 1604–11.

Reynolds, JOHN, 1789–1865. Gov. of Ill. 1832–34; M.C. 1835–37 and 1839–43. *Pioneer Hist. Illinois*, 1848.

Reynolds, JOHN FULTON, U.S.A., 1820–1863. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; distinguished in the Va. campaigns; killed at Gettysburg. Heroic statues of him are there and in Phila.—His brother, WILLIAM, U.S.N., 1815–1879, became Rear-admiral 1873, and was twice acting Sec. of the Navy.

Reynolds, JOSEPH JONES, U.S.A., b. 1822. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862, serving in the West.

Reynolds, SIR JOSHUA, 1723–1792. Greatest English painter of his century, especially famed for portraits; knighted 1769; pres. R.A. 1768–90. The large painting from the Gallery of the Earls of Westmoreland in the New York Metropolitan

The Young Widow, by Reynolds.

Museum is the finest example in America, and equal to any in England, where the National Gallery has many of his paintings. He was an excellent critic: his *Discourses on Painting* is a standard work.

Reynsso, ALVARO, b. ab. 1820. Cuban writer on sugar-cane.

Rezin, d. 732 B.C. King of Damascus, at war with Judah; destroyed by Assyria.

Rezonville. See GRAVELOTTE.

Rhabdocarpon. Ribbed nut-like fruit, found in the Coal Measures.

Rhabdocœla, or RHABDOCŒLIDA. Fresh water turbellarian worms, of small size and simple organization. The intestine is simple or slightly saccate; the mouth varies in position on the ventral side from the anterior end to the posterior. The body is ciliated.

Rhabdoid. In Plant Anatomy, needle-like body occurring in the cells of the leaves of insectivorous plants of the family *Droseraceæ*.

Rhabdophora. 1. Group of Nematode worms, free, marine, slender, bristled, and with two rows of præanal rods, by which they creep. 2. See GRAPTOLITIDÆ.

Rhabdopleura. See PHYLACTOLÆMATA and ASPIDOPHORA.

Rhabdus. Sponge spicule, developed along a single axis, but growing at both ends. There are several kinds; oxea, strongyle, tylote, and triæne.

Rhachiglossa. Group of ctenobranchiate Gastropods, including forms having a long proboscis, invaginable from the base, with a narrow radula having only three teeth in each transverse row. A siphon is present. The *Volutidæ*, *Olividæ*, *Fusus* (*Muricidæ* or *Canaliferæ*), and the Whelks (*Buccinum*, *Nassa*, and *Purpura*) are illustrations.

Rhachis. 1. Tergum or middle area of the back of all the segments of Trilobites. 2. Shaft of the feather, which bears the vane. See RACHIS.

Rhadamanthus. Son of Zeus and Europa; brother of Minos, King of Crete; for his justice, made one of the judges in the lower world.

Rhætia. Roman province, including what are now Tyrol and Canton Grisons. Its natives were conquered under Augustus and Tiberius.

Rhætizite. White variety of the mineral CYANITE (q.v.), found in the Tyrol.

Rhæto-Romance. Dialects, varying greatly in vocabulary, phonology, and inflections, between German and Italian speech, spoken in Switzerland, the Tyrol, and in parts of Italy by ab. 550,000 people.

Rhagon Type OF SPONGE (or DYSSYCUS TYPE). Including sponges with spherical chambers or ampullæ, to which het choanocytes are restricted, and to which incurrent canals run from the sponge-pores. This type may be simple or compound. In the latter case there are radial buds from the paragastric cavity, that receive each several apopyles or excurrent canals. Rhagons may be EURYPYLOUS, APHODAL, or DIPLODAL (q.v.).

Rhagophora (SCHIZONEMERTEA). Group of nemertean worms, characterized by having ciliated grooves on the head.

Rhamnaceæ. Natural family of flowering plants of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising ab. 45 genera and ab. 600 species of trees and shrubs, widely distributed throughout the globe; called the Buckthorn family.

Rhamphotheca. Sheath of the jaws of Birds.

Rhampsinitus. Egyptian king, perhaps Rameses III., owner of a treasure-house which, according to Herodotus, was robbed by the architect's two sons. The story has variants in almost every langugage.

Rhaphe. See RAPHE.

Rhapsodists. Reciters of Homer, Hesiod, and other poets in ancient Greece; itinerant performers, often artistic, highly valued, and important in their day for the preservation and popular diffusion of literature.

Rhatany. *Krameria triandra.* Low shrubby plant of the natural family *Krameriaceæ*, native of Peru and Bolivia. The roots are astringent, and are used medicinally.

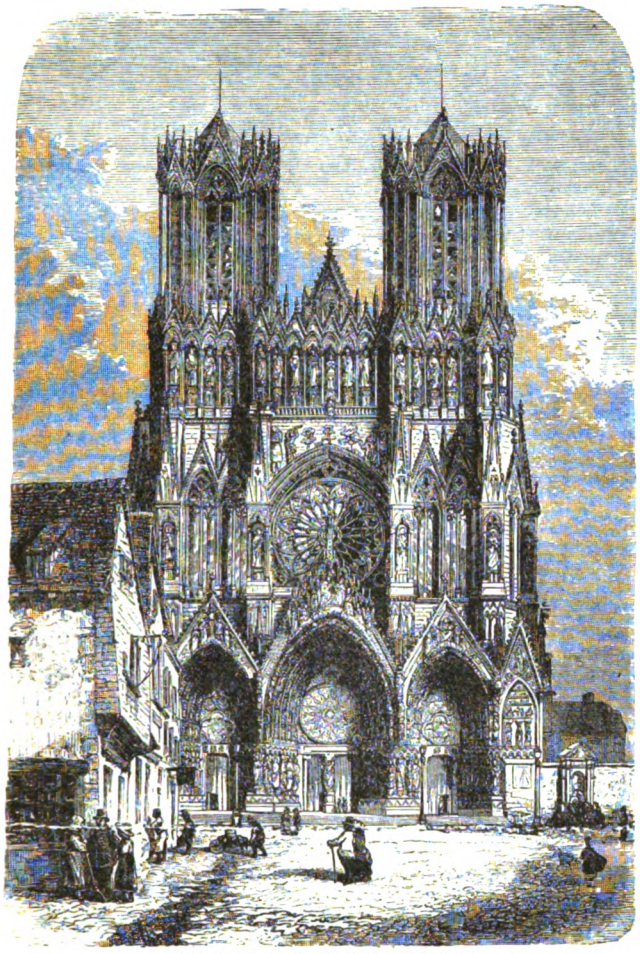
Rhea. Greek goddess of the earth, daughter of Uranus, wife of Cronos, and mother of Zeus, Hera, Poseidon, Hades, and other gods; later identified with the Asiatic goddess, "the great mother," Cybele or Dindymene, and worshiped in Phrygia and throughout Greece; regarded by the Romans as Ops, wife of Saturn. Her priests in Phrygia were the Corybantes, in Rome, the Galli. In works of art she sits on a throne, wears a mural crown, and is attended by a lion on either hand.

Rhea (AMERICAN OSTRICH). Cursorial bird of S. American pampas. It differs from the African Ostrich in smaller size and in having 3 toes, feathered neck, and no tail or wing-plumes. Its feathers are worth about $5 per bird for rugs, dusters, etc. It is being exterminated. The Indians hunt it with the bolas. It is polygamous; the male bird incubates the eggs. Three species have been described.

Rhegium. See REGGIO.

Rheidæ. See CURSORES (*Ratitæ*), and RHEA.

Rheims, or REIMS. Ancient city of n.e. France, on the Vesle, 100 m. e.n.e. of Paris; famous for the cathedral of Notre Dame, rebuilt 13th century, in which the kings, except Henri IV., were crowned 1179–1774. Councils were held here 1119



Façade of the Cathedral of Rheims.

and 1148. By the 10th century R. was celebrated for its schools. The English R. C. N. T. was issued here 1582. The city is a center of the woolen manufacture and the wine trade. Pop., 1891, 104,186.

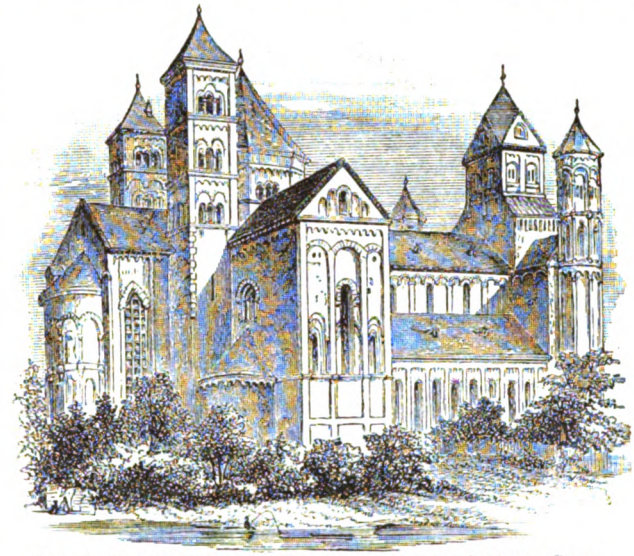
Rheinberger, JOSEPH GABRIEL, b. 1839. German composer, director Royal School of Music in Munich since 1867.

Rhenanus, BEATUS, 1485–1547. Alsatian editor of Livy, Tacitus, and other Latin classics.

Rhenish, or RHINE WINES. In a restricted sense those grown in the Rheingau, the southwest portion of Hesse Nassau, ab.25 m. long and 8 m. wide, on the right bank of the Rhine; in a general way the Moselle and Pfalz wines are included. The wines of the Rheingau of first growth or quality are Johannisberger, Steinberg, Rauenthaler, Gräfenberger, Rudesheimer, Marcobrunner, and Assmannshausen, the last being red, the others white wines. The Johannisberger is esteemed the best white wine of the world; the vineyard belongs to the Metternich estate and yields ab.7,200 gals. per annum. The total annual production of the district is 2,000,000 to 2,500,000 gals. The leading grape is the Riesling. The wines contain no sugar; of alcohol and tartaric acid as follows: Marcobrunner, 9.6 per cent alcohol, 6 grs. acid per oz.: Rudesheimer, 11.7 alcohol, 5.3 grs. acid; Steinberger, 13 per cent alcohol, 5.3 grs. acid. The Pfalz district (Bavarian Palatinate) gives the largest quantity of good Rhine wine; the first growths are Forst, Rupertsberger, Deidesheimer, Dürkheimer, Wachenheimer, and Ungsteiner. The province of Rheinhessen produces one first growth wine, Liebfrauenmilch. Moselle wines are produced in the triangle between the Moselle, Saar and Nahe rivers; they have an agreeable bouquet. Among the first growths are Braune-berger, Piesporter, and Zeltinger; the first named contains 9.4 per cent of alcohol and 9.8 grs. tartaric acid per oz. Scharzhofberger, one of the best of the wines of the Saar, which are usually sold as Moselle wines, contains 8.7 per cent of alcohol and 4.8 grs. of tartaric acid per oz. The wines of the Nahe, when of good quality, are sold as Rhine wine, otherwise as Moselle wine. The best of these white wines acquire in four or five years a delightful bouquet and a very pleasant taste, but of both of these they lose more or less as they grow older, and gain more strength and body. See MOSELLE WINES.

Rhenish Alliance. Formed July 12, 1806, under Napoleon's direction, by 16 princes of w. Germany.

Rhenish Architecture. Unique styles of building that have prevailed upon the banks of the Rhine, especially applied to the German Romanesque from the 9th to the 13th centuries. In its earlier phases the style has much in common with the Romanesque in Lombard architecture of n. Italy, but in the 12th century it attained a very individual expression. Among its chief monuments are the cathedrals at Spires, Worms, and



Church of the Benedictine Abbey at Laach, near Coblentz, Germ.

Mayence, and the churches at Cologne, Bonn, and Laach. In secular architecture the chief examples of the style are the palaces of Gelnhausen and the Wartburg.

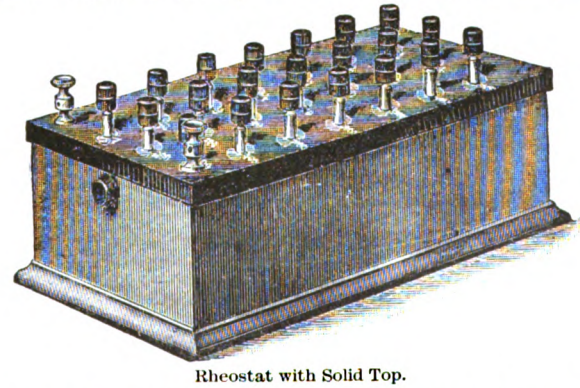
Rheochord. Long wire, usually platinum or German silver, so arranged, either in a straight line, circle, or spiral, that any required proportion of it may be put into an electric circuit by a sliding contact, and thus a corresponding resistance interposed in the circuit.

Rheolyser. Apparatus devised by Wartmann for maintaining constant the strength of an electric current by the automatic adjustment of a variable resistance.

Rheometer. Instrument for measuring flow, as that of a Voltaic current.

Rheoscope. Instrument to detect flow, as that of a current of electricity or of water.

Rheostat. Instrument by which the resistance of any electric circuit can be varied without opening the circuit. It consists ordinarily of a set of wire coils of variable resistance, placed in a box, their ends being joined to pieces of brass fastened on the cover. Whenever these pieces are not in contact, the current



Rheostat with Solid Top.

is obliged to pass through the wire coils, but if a plug of metal be inserted between any two brass pieces, that coil which has its ends joined to them is short-circuited and the resistance of the circuit decreased proportionately. Wheatstone's rheostat, which is capable of more gradual variations, consists of two

parallel revolving cylinders, one conducting, the other insulating. On the latter a spiral groove is cut, in which is coiled part of ab. 40 meters of brass wire, the rest being wound on the conducting cylinder. If one end of a circuit be attached to the latter and the other be joined to the end of the brass wire which is on the insulating cylinder, the current will experience resistance from that part of the brass wire only which is coiled in the groove: by turning the cylinders and so transferring more of the wire from one cylinder to the other, this can be regulated at will.

Rheotrope. See COMMUTATOR.

Rheotropism. Phenomena exhibited by vegetable organs when exposed to currents of water, some assuming their direction of growth with that of the current, others against it.

Rhetoric. Art of discourse; variously defined, divided, and treated, by innumerable teachers and authors; very seriously regarded and practiced in classic and mediæval times; more loosely and variously handled, and less esteemed, with us. The chief ancient writers upon it were Aristotle, Longinus, and Quintilian; the chief English authorities are Blair, Kames, Campbell, and Whately.

Rhett, ROBERT BARNWELL, 1800–1876. M.C. from S. C. 1837–49; U. S. Senator 1851–52; ed. Charleston *Mercury;* secession leader.

Rheumatism. Diseased condition characterized by an excess of acid in the body. In the acute form, rheumatic fever, inflammatory rheumatism, there is great pain, inflammatory swelling of the joints, and high fever. Other serous membranes, *e.g.*, the endocardium, are liable to be attacked, hence the frequent dependence of some forms of heart disease upon rheumatism. The chronic form is more apt to occur in older people, and is characterized by pain, stiffness of the joints, and deformity. Among the medicines used are rochelle salt, colchicum, potassium iodide, and lithium carbonate.

Rhianus, 3d cent. B.C. Greek epic poet of Crete.

Rhigolene. See PETROLEUM.

Rhind, ALEXANDER COLDEN, U.S.N., b. 1821. Commander 1863; distinguished in the attacks on Charleston, Fort Wagner, and Fort Fisher; Captain 1870, Commodore 1876, Rear-admiral 1883.

Rhine. River of Europe, famous for its beauty and historic associations. It heads in the Swiss Alps, flows through the Lake of Constance, and forms the n. boundary of Switzerland. At Basle it turns n. and enters Germany. At Mayence it turns n.w., entering Holland, then w., reaching the North Sea through an extensive delta. Length 960 m., drainage area 76,000 sq. m.

Rhine, CONFEDERATION OF. See CONFEDERATION OF THE RHINE.

Rhinoceroses. Of living forms there are three subgenera, each with two species. 1. *Rhinoceros* of India, Java,

Rhinoceros (*Atelodus bicornis*).

etc., has one nasal horn, canines, one pair lower incisors, and shields of thickened skin on neck, shoulders, and hind quarters. 2. *Atelodus* of Africa has a nasal horn and a frontal horn, but lacks incisors, canines, and skin shields. 3. *Ceratorhinus* of the Malay peninsula, etc., has dentition of *Rhinoceros* and horns like *Atelodus*. The largest Rhinoceroses exceed 6 ft. in ht. and 10 ft. in length. The White Rhinoceros. *A. simis*, of w. Africa, is now rare. It has a square head and feeds on grass. Its anterior horn may reach 4 ft. in length, and posterior one 2 ft. *A. bicornis*, the Black, and *A. keitloa*, the Blue Rhinoceros (which latter has horns of equal length), range s. from Abyssinia, and feed on bushes. These African forms differ but little in color. There are 27 fossil species, half being American, and most Eocene. They died out in the Miocene, but in Europe survived the Mammoth. A woolly Rhinoceros has been found incased in Siberian ice.

Rhinocerotidæ (RHINOCERIDÆ). Family of *Perissodactyla*, comprising the Rhinoceroses. One or two horns, consisting of agglutinated, strongly developed hairs, are present, and the nasal bones are greatly developed. The Indian Rhinoceros, being one horned, was probably the Unicorn of the Ancients. The *Diceratherium*, from the Miocene deposits of Oregon, had two horns side by side on the nose, and differed further, in having four toes on the forefeet.

Rhinolophidæ. See BATS.

Rhinoplastic Operation. Plastic operation on the nose to replace lost tissue. A flap is taken from some other part of the body; *e.g.*, the forehead, the cheek or the arm, stitched to the healthy margins surrounding the destroyed portion of the nose. When a new circulation is established, the flap is severed from its original site.

Rhinotheca. Sheath of the upper jaw of Birds.

Rhinthon, 4th cent. B.C. Greek poet of Tarentum.

Rhipidium. Modification of the cymose flower-cluster.

Rhipidoglossa. Group of ctenobranchiate Gastropods, including forms having numerous lateral plates in each transverse row of teeth of the radula, which are arrayed in a fan-like manner. Here belong the *Trochidæ*, with conical shells and spiral operculum, the foot prolonged into cirri and lobes, and eyes on short stalks; also the *Neritidæ*, with thick hemispherical shells and stalked eyes behind two long tentacles: the foot is triangular, the proboscis is short and sometimes bilobed. In a broad sense the group comprises the ZEUGOBRANCHIA and SCUTIBRANCHIA (q.v.) (restricted), and is then the equivalent of *Aspidobranchia* (*Podophthalma*).

Rhizocarpeæ. Class of the heterosporous *Pteridophyta*, comprising some floating plants such as *Marsilea*, *Pilularia*, and *Salvinia*, having their spore-cases borne mainly near the roots.

Rhizocephala. See SUCTORIA.

Rhizodus. Crossopterygian, lepidoganoid fish of the Carboniferous, formerly confounded with *Megalichthys* and *Holoptychius*, but distinguished from the former by the circular shape of its scales, and from the latter by the form and strength of its teeth.

Rhizogen. Plants parasitic upon the roots of others.

Rhizogenetic. Certain cells in the roots of plants which give rise to the rootlets.

Rhizoids. Rootlets arising from the lower surfaces of lichens and other *Thallophytes*, and from the prothallia of ferns.

Rhizome. Portion of a perennial stem or branch lying prostrate or wholly subterranean, as in many ferns; synonymous with Rootstock.

Rhizomorphs. Strands and fibers of mycelia of various *Fungi* developed in the dark, having much the appearance of roots. They are found especially in mines and under logs.

Rhizophaga, or GLIRINA. Tribe of diprotodont Marsupials of the size of a Badger, with rodent-like teeth, close soft fur, short limbs, claws on the toes, except the rudimentary inner toe of the hind foot, and a rudimentary tail. The Wombat (*Phascolomys*) is an example.

Rhizophoraceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 17 genera and ab. 50 species, all growing within the tropics, many being found on the miry shores of rivers; called the Mangrove family.

Rhizophore. Structure intermediate between the stem and the roots, found in certain *Selaginellaceæ*.

Rhizopoda, or SARCODINA. Class of *Protozoa*, whose soft protoplasmic body can form pseudopodia, and which is not differentiated into a firm membrane at the surface, although usually a silicious skeleton or a calcareous shell is present. There are three sub-classes, *Foraminifera*, *Heliozoa*, and *Radiolaria*. See also GYMNOMYXA.

Rhizostomeæ (or RHIZOSTOMIDA; POLYSTOMÆ). Discophorous jelly-fish, without a central mouth, because the eight oral arms have united, leaving funnel-shaped slits, through which food is sucked in. There are no marginal tentacles, but eight (or twelve) sense organs. *Cassiopeia* is an example. See CRAMBESSIDÆ.

Rhizotaxis. Arrangement of roots on plants.

Rhodamine. $C_{28}H_{31}N_2O_3Cl$. Product of the action of phthalic anhydride upon diethylmetaamidophenol; green crystals, soluble in water. It dyes wool and silk red, and cotton a beautiful violet red upon a tannin mordant.

Rhode Island. One of the n.e. States. Its area is 1,250 sq. m. The surface is undulating and in many parts even hilly, the hills being of glacial origin. It has no navigable rivers of any consequence, but has a large extent of seacoast upon Narragansett Bay, which projects far inland, and has given it, from the first, an important commerce. In later years, with the decline of that industry, very extensive manufactures have developed, to which the water power of the numerous small streams has greatly contributed. In 1890 there was invested in manufactures $126,483,401, and the manufactured product was valued at $142,500,625. It is the most densely settled of the States, having a population of 276 per sq. m. The principal cities are Providence, Pawtucket, Woonsocket, and Newport. The first settlement of R. I. was made 1636 at Providence by Roger Williams, who had been driven from Mass. In 1643 he went to England and obtained a patent, which remained in force until 1663, when a charter was granted by Charles II., incorporating the colony of R. I. and Providence Plantations. This instrument was long the fundamental law of R. I. When in 1686 the charters were withdrawn from Mass. and other colonies, R. I., with Conn., resisted the demand. It was active in the war for independence, but was the last of the 13 States to accept the constitution. After its entrance into the Union, it adhered to its colonial charter until 1842. It is the only State which still has two capitals, the general assembly meeting for a short session at Newport and adjourning for the transaction of actual business to Providence. Pop., 1890, 345,506. (See Map, p. 1288.)

Rhodes. Island off s.w. coast of Asia Minor; taken by Vespasian 71; held by Knights Hospitalers 1309–1523, and since by the Turks. The chief city, at its e. end, was anciently famed for its COLOSSUS, (q.v.) one of the Seven Wonders of the World. Area 420 sq. miles, present pop. ab. 36,000.

Bird's-eye View of Rhodes.

Rhodes, CECIL, b. 1853 in England. In S. Africa from 1873; Prime Minister of Cape Colony 1890; founder and head of British S. African Co.; of great ability, wealth, and influence; examined in London 1897 as to his connection with Dr. Jameson's raid into the Transvaal. His aim has long been to bring all S. Africa under British rule.

Rhodes, KNIGHTS OF. See KNIGHTS OF ST. JOHN.

Rhodium. Rh. At. wt. 103, sp. gr. 12.1, sp. ht. .054, mpt. 2,000° C., valence II. IV. VI. Discovered by Wollaston 1803; it occurs with platinum, 0.4 to 3 per cent; heavy metal. When pure, it is not attacked by acids or aqua regia, but dissolves in the latter when alloyed with platinum. It forms three oxides, RhO, Rh_2O_3 and RhO_2, and one chloride, Rh_2Cl_6. The element and its compounds are rare.

Rhodium, OIL OF. Perfume possessing cordial and tonic virtues, obtained from the root of *Rhodoriza scoparia* and *R. florida*. Horses, fishes, and rats are very fond of the odor.

Rhodium Dichloride. $RhCl_2$. Grayish red to dirty violet powder, made by treating the hydrated oxide with hydrochloric acid.

Rhodium Hydroxide. $Rh_2(OH)_6$. Porous gray substance, of metallic luster, made by treating the double chloride of sodium and rhodium with caustic potash; used as a starting point in the preparation of other rhodium salts.

Rhodium Monosulphide. RhS. Blue-white metallic substance, made by fusing rhodium and pyrites together.

Rhodium Nitrate. $Rh_2(NO_3)_6+4H_2O$. Red amorphous substance, obtained by dissolving the hydroxide in nitric acid.

Rhodium Oxides. RhO. Monoxide. Metallic gray powder, indifferent to acids; obtained by igniting finely divided rhodium.—Rh_2O_3. Sesquioxide. Fibrous substance of metallic luster; obtained by heating the nitrate.—RhO_2. Dioxide. Brown powder, insoluble in acids and boiling potash; made by repeated fusing of the metal with potassium nitrate and hydroxide.

Rhodium Sesquichloride. Rh_2Cl_6. Bright red crystalline powder, insoluble in hydrochloric acid or aqua regia; made by heating an alloy of tin and rhodium in a current of chlorine.

Rhodium Sesquisulphide. Rh_2S_3. Black crystalline leaflets, soluble in bromine and aqua regia; made by heating the dry sesquichloride in hydrogen sulphide at 360° C.

Rhodium Sulphate. $Rh_2(SO_4)_3+12H_2O$. White or lemon yellow crystals. It forms alums, and is made by dissolving the hydroxide in sulphuric acid.

Rhodochrosite. $MnCO_3$. Manganese carbonate, of rather rare occurrence as a mineral, except in association in veins with ores of silver and lead. In crystallization and general appearance it strongly resembles calcite, but its color is usually some shade of red. See MANGANESE ORES.

Rhododendron. Genus of showy-flowered shrubs of the natural family *Ericaceæ*, widely distributed, and much

Rhododendrons.

planted for ornament; known as Rose-bay and Great Laurel. Rhodora, *Rhododendron canadense*, is a native of the n.e. U.S., flowering in spring before its leaves appear.

Rhodology. Study of roses.

Rhodonite. $MnSiO_3$. Mineral manganese silicate, of a reddish color, and frequently having a strong resemblance to some varieties of feldspar. The manganese is often replaced in part by iron or calcium, sometimes, as in n. N. J., by zinc. See MANGANESE ORES.

Rhodope. Mountain chain in Thrace, reaching heights of near 7,500 ft.; noted for its monasteries, especially Rils.

Rhodophyll. Pigment found in the *Florideæ* or red *Algæ*.

Rhodospermeæ. See FLORIDEÆ.

Rhodospermin. Coloring matter of red seaweeds.

Rhodosporeæ. See FLORIDEÆ.

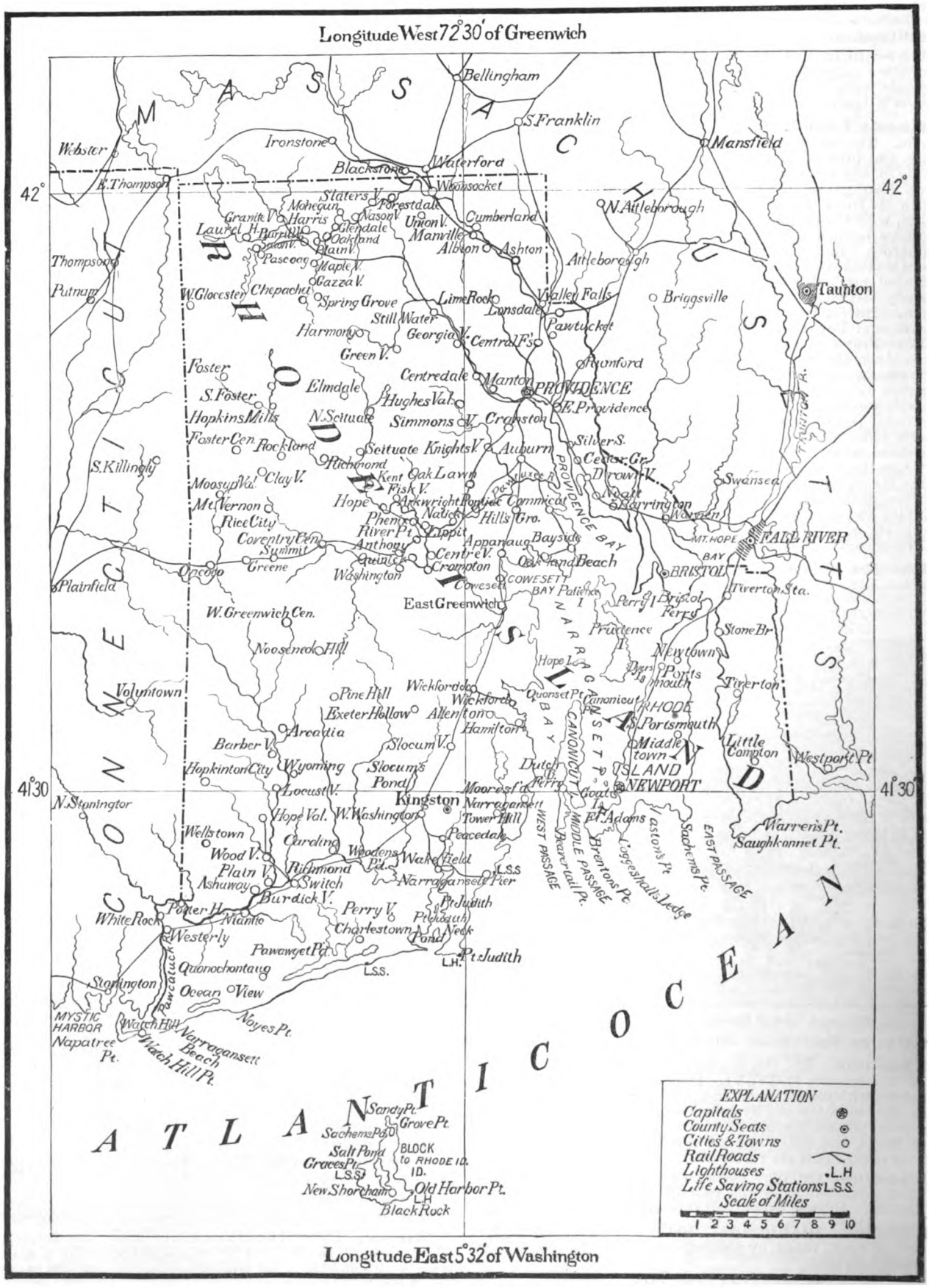
Rhombohedron. Polyhedron bounded by six faces, each a rhombus.

Rhomboid. Oblique-angled parallelogram.

Rhombus. Equilateral oblique-angled parallelogram.

Rhone. River of s.e. France. It rises in the Swiss Alps, flows through the Lake of Geneva, and thence by a s. course reaches its mouth, in the Gulf of Lyons. Length 525 m., drainage area 36,781 sq. m.

Rhopalocera. Tribe of *Lepidoptera*, including the butter-


Longitude West 72°30' of Greenwich
Longitude East 5°32' of Washington
42°
41°30'
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
ATLANTIC OCEAN
Bellingham
S. Franklin
Mansfield
Webster
Ironstone
Blackstone
Waterford
Woonsocket
E. Thompson
Staters V.
Forestdale
Mohegan
Harris
Nason V.
Union V.
Cumberland
N. Attleborough
Granite V.
Laurel H.
Glendale
Oakland
Mansville
Albion
Ashton
Attleborough
Thompson
Pascoag
Maple V.
Gazza V.
Putnam
W. Glocester
Chepachet
Spring Grove
Lime Rock
Valley Falls
Briggsville
Taunton
Still Water
Lonsdale
Pawtucket
Harmony
Georgia V.
Central F's
Green V.
Foster
Centredale
Manton
Pawtucket
PROVIDENCE
Elmdale
Hughes Val.
E. Providence
S. Foster
Hopkins Mills
N. Scituate
Simmons V.
Cranston
Foster Cen.
Rockland
Scituate
Knights V.
Auburn
Silver S.
Cedar Gr.
S. Killingly
Richmond
Kent
Oak Lawn
Drown V.
Moosup Val.
Clay V.
Fisk V.
Swansea
Mt. Vernon
Hope
Arkwright
Pontiac
Commiot
Warren
Rice City
Phenix
Natick
Hills Gro.
River Pt.
Hoppit
Coventry Cen.
Anthony
Apponaug
Baysuide
MT. HOPE BAY
FALL RIVER
Summit
Centre V.
Oakland Beach
Greene
Quinton
Crompton
BRISTOL
Oneco
Washington
COWESETT BAY
Coventry
Tiverton Sta.
Plainfield
East Greenwich
Patience I.
Perry I.
Bristol Ferry
W. Greenwich Cen.
Prudence I.
Stone Br.
Nooseneck Hill
Newtown
Hope Val.
Portsmouth
Tiverton
Voluntown
Pine Hill
Wickford Jct.
Wickford
Quonset Pt.
Conanicut I.
Exeter Hollow
Allenton
Hamilton
RHODE ISLAND
S. Portsmouth
Arcadia
Barber V.
Slocum V.
Middletown
Little Compton
Hopkinton City
Wyoming
Slocum's Pond
Dutch I.
Perry
Westport Pt.
Locust V.
Moorefield
Goat I.
NEWPORT
N. Stonington
Kingston
Narragansett
Tower Hill
Ft. Adams
Hope Val.
W. Washington
Peacedale
Warren's Pt.
Saughkonnet Pt.
Wellstown
Carolina
Wodens Pt.
Wakefield
Wood V.
Plain V.
Richmond
Switch
L.S.S.
Narragansett Pier
Ashaway
Burdick V.
Pt. Judith
Potter H.
Perry V.
Pt. Judith Neck
White Rock
Niantic
Westerly
Charlestown
Pawaget Pt.
Pt. Judith
L.H.
L.S.S.
Quonochontaug
Stonington
Ocean View
Pawcatuck
MYSTIC HARBOR
Watch Hill
Noyes Pt.
Napatree Pt.
Narragansett Beach
Watch Hill Pt.
Sandy Pt.
Grove Pt.
Sachems Pt.
Salt Pond
BLOCK ISLAND
Graces Pt.
L.S.S.
New Shoreham
Old Harbor Pt.
L.H.
Block Rock
PROVIDENCE BAY
NARRAGANSETT BAY
CANONICUT BAY
WEST PASSAGE
MIDDLE PASSAGE
EAST PASSAGE
Brenton's Pt.
Hazard's Pt.
Sachems Pt.
Coggeshall's Ledge
EXPLANATION
Capitals
County Seats
Cities & Towns
Railroads
Lighthouses L.H.
Life Saving Stations L.S.S.
Scale of Miles
1 2 3 4 5 6 7 8 9 10

flies. They are of slender build, and usually have brightly colored wings. The antennæ are knobbed at the end; the legs are slender. They fly by day, and when at rest hold the wings vertical. The caterpillars have 16 feet, are naked, hairy or spiny, and develop mostly without cocoons. The pupa is often of a metallic color, and is attached to objects by threads.

Rhubarb. Perennial herbs of the genus *Rheum*, natural family *Polygonaceæ*, natives of Russia and n. Asia, their roots are extensively collected for medicine. *R. rhaponticum* is widely cultivated in gardens for its large leaf-stalk, used as a culinary vegetable and for domestic wine.

Rhubarb (*Rheum officinale*).

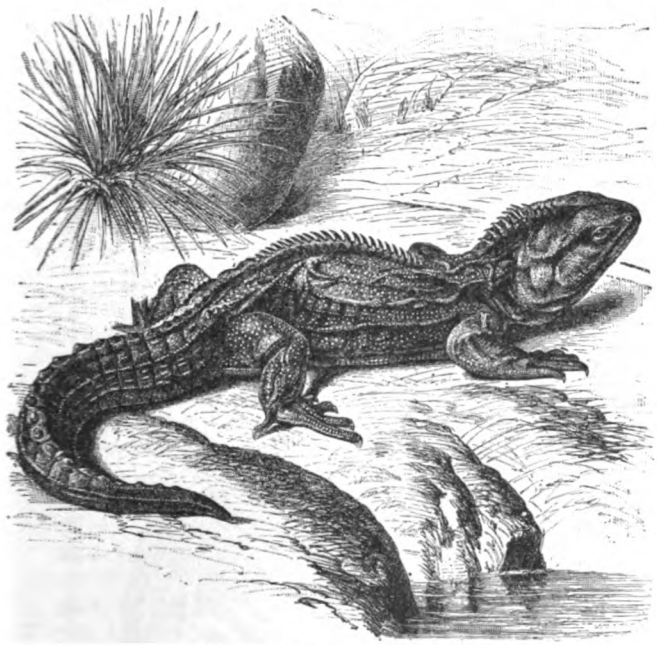
Rhumb Line. Course of a vessel cutting all meridians at the same angle.

Rhyme (better RIME, as it has nothing to do with rhythm). Harmony or agreement, in whole or part, of accented syllables. It may be (*a*) *Perfect*, as in Chaucerian English and in modern French; (*b*) *Partial*, which may be (1) agreement of initial sounds, or Alliteration (*brave : bring*), or (2) agreement of final sounds, ordinary Rhyme (*bring : sing*); (c) agreement of vowels alone, Assonance, as in Spanish ballads (*black : dance*). Rhyme as a fixed principle of verse is modern, but it occurs sporadically in Greek and Latin classics. It came in ab.400, advanced slowly, and reached its acme in the mediæval Latin hymns. It appeals to and is judged by the ear, not the eye; thus "off" and "cough" are rhymes, "been" and "seen" are not. See PROSODY.

Rhymer, THOMAS, THE. Scottish poet, probably T. Learmount of Ercildoune, ab.1280; supposed author of *Prophecies*, pub. 1603, and of *Sir Tristram*, ed. by Sir W. Scott 1806.

Rhynchobdellidæ. Leeches with a protrusible proboscis in the pharynx, a sucker at each end of body, and paired eyes on the anterior sucker. Here belong *Clepsine* and the Mexican medicinal leech.

Rhynchocephalia. Order of Reptiles including *Hatteria* (or *Sphenodon*) of New Zealand and several extinct species. *Hatteria* resembles an *Iguana;* the lungs are amphibian-like, the pecten of eye and copulatory organ are absent, the



Hatteria (*Sphenodon punctatus*).

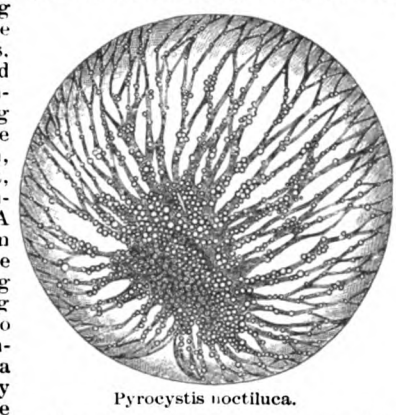
vertebræ are biconcave, the ribs have uncinate processes, the teeth are in rows on jaws and palate. The length of body is 20 inches. As the natives use them for food, they are being exterminated. *Proterosaurus* is a fossil aquatic reptile belonging in this group.

Rhynchoceti (HYPERODONTIDÆ). See ODONTOCETI.

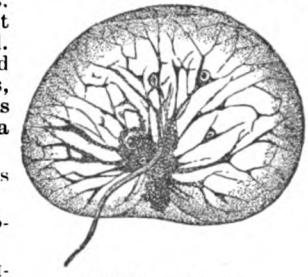
Rhynchocœla. See NEMERTEA.

Rhynchodus. Fish of the corniferous limestone of Ohio, whose shearing teeth somewhat resembled on a large scale those of the modern *Chimœra*.

Rhynchoflagellata (CYSTOFLAGELLATA). Sub-class of *Flagellata*, including *Noctiluca*. This is one of the large Protozoöns, being visible to the naked eye. It has a peach-shaped body, consisting of a sac-like envelope lined by protoplasm, pitted in at one point, from which a thick stem-like tentacle projects. A large mass of protoplasm is situated near the base of this stem, containing the nucleus, and sending branched pseudopodia to different parts of the envelope. There is also a slender flagellum. They reproduce by bud-like spores. A large part of the phosphorescence of the sea is due to the presence of these animals, each of which emits a bright light when the water near it is agitated. *Pyrocystis* is probably an encysted resting noctiluca. A second genus, *Leptodiscus*, is also included in this group. It is saucer-shaped like a Medusa.



Pyrocystis noctiluca.



Noctiluca miliaris.

Rhyncholites. Fossil beaks of Cephalopods.

Rhyncholophidæ (RINOLOPHIDÆ). See BATS.

Rhynchonella. See TESTICARDINES.

Rhynchota (HEMIPTERA). Insects with a jointed rostrum or tube, formed from the labium, in which the mandibles and maxillæ work to suck up fluid food. (Some *Hemiptera* have biting mouth parts.) The prothorax is usually free. The metamorphosis is incomplete. The group includes four suborders: *Aptera*, *Phytophthires*, *Homoptera*, and *Hemiptera* (restricted).

Rhys, JOHN, b. 1840. Prof. of Celtic at Oxford 1877. *Welsh Philology*, 1877; *Celtic Britain*, 1882; *Arthurian Legends*, 1891.

Rhythm. Succession of small, approximately equal intervals of time, separated by corresponding stimuli of sound, sight or muscular movement; also phenomena of the physical world characterized by regular succession or alternation; *e.g.*, alternation of day and night, or regular succession of the seasons. In these cases the term periodicity is preferable. In physiology the term rhythm is applied to alternating periods of activity and comparative rest; *e.g.*, the heart beat, or respiration. The basal principle of the so-called arts of motion, music, poetry, and the dance, is rhythm. The psychological basis of the esthetic value of rhythm is matter of dispute. See PROSODY.

Rialto. One of the islets on which Venice is built. The bridge, built 1588 by Antonio da Ponte, is a marble arch with

Bridge of the Rialto.

a span of 91 ft. and a height above water of 24½ ft. The footway is 72 ft. wide.

Rib. In Gothic Architecture, the arch forming the subdivision of a vault.

Rib. Narrow block or strip of coal or ore, left standing in a mine as a protection to a shaft or gallery, or as a support for the roof.

Ribalba, FRANCISCO, 1551–1628. Spanish painter.

Ribas, JOSÉ FELIX, 1775–1815. Venezuelan general, shot by Spaniards.

Ribaut, or **Ribault,** JEAN, 1520–1565. Leader of French Protestant colonies to Fla. 1562–65; murdered by Spaniards.

Ribbeck, JOHANN KARL OTTO, b. 1827. Prof. of Classical Philology at Leipzig. Best known by his edition of *Virgil*, 1859–69, and histories of different departments of Roman literature.

Ribbed Arch. Metallic arch having two ribs connected by radial or diagonal ribs. They have been used for spans of 550 ft., as in the bridge over the Mississippi at St. Louis.

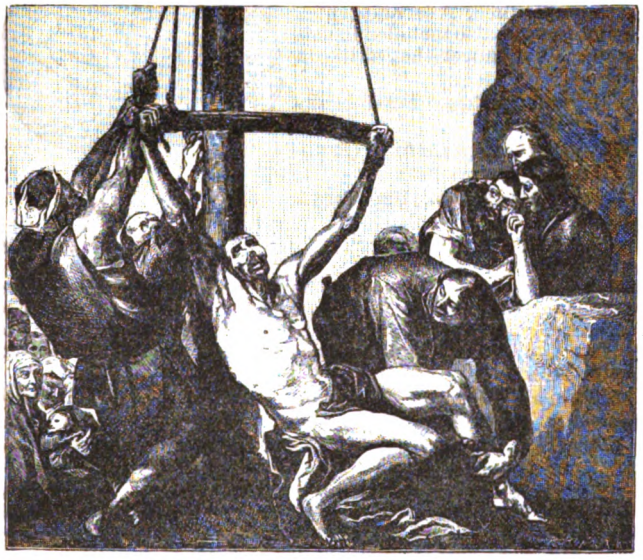
Ribbon. Narrow bands of silk, used chiefly in ornamentation. It was used from remote antiquity, though only extensively from the 17th century. Ribbon made by hand looms is superior to that made by power looms.

Ribbonism. See RIBBONMEN.

Ribbonmen. Members of secret associations in Ireland 1820–70; named from a green badge; said to have originated in opposition to the Orange society. Their main object was fixity of tenure in regard to holdings of land. The R. C. clergy condemned the organization, to which were attributed many of the agrarian disorders and murders between 1858 and 1879.

Ribeiro, BERNARDIN, ab.1485–ab.1550. Portuguese poet, noted for his eclogues. *Menina e Moça*, 1554.

Ribera, JUSEPE DE ("SPAGNOLETTO"), 1588–1656. Spanish painter, educated in Rome and resident mostly in Naples. His



Martyrdom of St. Bartholomew, by Ribera.

best work is in n. Europe: the *St. Mary of Egypt* is in Dresden. In Madrid are his *Jacob's Ladder*, *St. Bartholomew*, and many others.

Ribgrass. *Plantago lanceolata.* Long-leaved herb of the Plantain family, native of Europe, introduced as a weed into America; known as Ripplegrass and English Plantain.

Ribot, ALEXANDRE FÉLIX JOSEPH, b. 1842. French Deputy 1878; Foreign Minister 1890; Premier 1892–93 and 1895.

Ribot, AUGUSTIN THÉODULE, 1823–1891. French artist of great power, painting in low tones.

Ribot, THEODULE ARMAND, b. 1839. Prof. Coll. de France 1888; ed. *Revue Philosophique*, 1876–94; writer on psychology. *Maladies de la Memoire*, 1881.

Ribs. Long, flat, curved bones, articulating with the vertebræ on the back and the breast-bone in front. They form the sides of the bony wall of the chest and by their rise and fall assist in respiration. There are 12 pairs of ribs in man; 7 true ribs directly attached to the sternum, 5 false ribs not directly so attached, the last two floating ribs, with one end free.

Ribs (IN BOTANY). See VEINS.

Ricardo, DAVID, 1772–1823. English economist of Jewish parentage. He became wealthy as member of the stock exchange, and was a student of mathematics and the natural sciences. His *Principles of Political Economy and Taxation*, 1817, was notable for the doctrines of rent and of wages.

Ricasoli, BETTINO, BARON, 1809–1880. Florentine patriot; dictator or gov. of Tuscany 1859–61; premier of Italy 1861–62 and 1866–67.

Ricaurte, ANTONIO, 1792–1814. Colombian patriot, who won a battle for freedom by his heroic sacrifice.

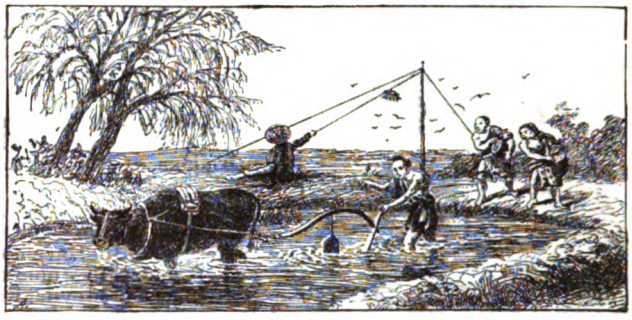
Ricci, LORENZO, 1709–1775. General of the Jesuits 1758–73. —His nephew, SCIPIONE, 1741–1810, Bp. of Pistoia and Prato 1780–91, attempted reforms, and left *Memoirs*, pub. 1865.

Ricci, MATTEO, 1552–1610. Jesuit missionary in China.

Ricciaceæ. Family of aquatic Liverworts (*Hepaticæ*).

Riccio, DAVID. See RIZZIO.

Rice. *Oryza sativa.* Annual grass, native of India; universally cultivated in warm countries for its grain, which is the



Culture of Rice in Japan.

principal food of the natives of s. Asia. U. S., in 1889, produced 128,590,434 lbs., on 161,312 acres of land, chiefly in S. C. and La.

Rice, MOUNTAIN. Woodland grasses of the genus *Oryzopsis*, natives of N. America.

Rice, WATER. *Zizania aquatica.* Tall marsh grass, native of N. America; known also as Water Oats and Indian Rice.

Rice, ALEXANDER HAMILTON, 1818–1895. Mayor of Boston 1855 and 1857; M.C. 1859–67; Gov. of Mass. 1876–79.

Rice, ALLEN THORNDIKE, 1853–1889. Owner (1876) and ed. *N. American Review.*

Rice, JAMES, 1844–1882. English novelist, in collaboration with Besant; ed. *Once a Week*, 1868–72.

Rice Bird. See BOBOLINK.

Rice Paper. Chinese paper, made from the pith of *Fatsia papyrifera* of Formosa, 10 by 15 in. The pith is opened out into a sheet. It is used for colored drawings. The rice paper used in cigarettes is made by the ordinary paper process.

Rich, CLAUDIUS JAMES, 1787–1821. English traveler and Orientalist.

Rich, EDMUND, ab.1170–1240. Abp. of Canterbury 1234; supporter of popular rights against King and Pope; exiled 1240; canonized 1247.

Richard I., "CŒUR DE LION," 1157–1199. King of England 1189; son of Henry II.; distinguished in 3d crusade 1190; imprisoned in Austria 1192–94; killed in war with France.

Richard II., 1366–1400. King of England 1377; son of the Black Prince; defeated and deposed by his cousin Henry IV. 1399; probably murdered.

Richard III., 1452–1485. King of England 1483; son

Richard III.

of Richard of York; guardian of his nephews, sons of Edward IV., whom he is suspected of murdering; defeated

and killed by the Earl of Richmond (Henry VII.) at Bosworth. He was probably not a hunchback, as represented in legends.

Richard OF CIRENCESTER, ab.1335–1401. Monk of Westminster; chronicler. *De Situ Britanniæ*, pub. 1758 by C. J. Bertram, long passed as his.

Richard OF CORNWALL, 1209–1272. Son of King John; King of the Romans 1257, with some shadowy rights in Germany.

Richard, ACHILLE, 1794–1859. Prof. of Botany in Paris 1831. *Botanique et de physiologie vegetale*, 1819; *Botanique medicale*, 1823; *Dictionaire des drogues*, 1827–29; *Elemens d'histoire naturelle medicale*, 1831; *Tentamen Floræ Abyssinicæ*, 1847–51.

Richard, LOUIS CLAUDE MARIE, 1754–1821. French botanist. *Demonstrations botaniques*, 1808, tr. 1819; *Commentatio botanica de Coniferiis et Cycadeis*, 1826; *Flora boreali-americana*, 1803.

Richard OF ST. VICTOR, d. 1173. Scottish mystic, prior of the Augustinian abbey at Paris.

Richards, BRINLEY, 1819–1885. English composer, chiefly of songs.

Richards, JOSEPH WILLIAM, Ph.D., b. 1864. Asst. prof. Lehigh Univ. 1897. *Aluminium: its Properties, Metallurgy, and Alloys*, 1887–96.

Richards, THOMAS ADDISON, b. 1820. N. A. 1851. Landscape painter and illustrator; Prof. of Art in Univ. New York 1867.

Richards, WILLIAM TROST, b. 1833. American painter.

Richardson, SIR BENJAMIN WARD, M.D., LL.D., F.R.S., 1828–1896. London practitioner, knighted 1893; inventor of several medical appliances; founder *Journal of Health*, 1855, and *Social Science Review*, 1862. *Alcohol*, 1869–75; *Hygeia*, 1876; *Health*, 1887–90; *Vita Medica*, 1897.

Richardson, CHARLES, 1775–1865. English lexicographer. *Philology*, 1815; *Study of Language*, 1854. His *New Dictionary*, 1837, was in its day considered the best.

Richardson, CHARLES FRANCIS, b. 1851. Prof. Dartmouth 1882. *Choice of Books*, 1881; *American Literature*, 1887–88.

Richardson, HENRY HOBSON, 1838–1886. American architect of highest repute, active chiefly in and near Boston, where Trinity Ch. is one of his most noted erections.

Richardson, ISRAEL BUSH, U.S.A., 1815–1862. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; distinguished in Va.; mortally wounded at Antietam.

Richardson, JAMES, 1809–1851. English traveler in Africa 1845–46 and 1850–51.

Richardson, SIR JOHN, 1787–1865. Scottish surgeon and Arctic explorer, knighted 1846. *Fauna Boreali Americana*, 4 vols., 1829–1837.

Richardson, SAMUEL, 1689–1761. English novelist. His *Pamela*, 1740, *Clarissa Harlowe*, 1748, and *Sir Charles Grandison*, 1754, are in epistolary form, and deal at inordinate length with the motives, manners, and costumes of women. They were very popular, and were forerunners of the modern society novel: the best, *Clarissa*, is still read in a recent abridgment.

Richardson, WILLIAM ADAMS, LL.D., 1821–1896. Judge U. S. Court of Claims 1874, Chief-justice 1885. *Banking Laws of Mass.*, 1855; *Public Debt of U. S.*, 1872; *Hist. Court of Claims*, 1882–85.

Richardson, WILLIAM MERCHANT, LL.D., 1774–1838. Chief-justice of New Hampshire 1812–34. *Reports*, 11 vols., 1819–44.

Richardt, CHRISTIAN ERNST, 1831–1893. Danish lyric and dramatic poet.

Riché, JEAN BAPTISTE, 1780–1847. Haytian general 1807, Pres. 1846; noted for cruelty.

Richel, NICOLAS ANTOINE, 1745–1799. Haytian botanist. *Flore de St. Domingue*, 6 vols., 1785–90.

Richelieu, ARMAND JEAN DUPLESSIS, DUC DE, 1585–1642. Bp. of Luçon 1607; State Councilor 1614; Cardinal 1622; one of the greatest rulers of France, and ally of German Protestants in the Thirty Years' War; from 1624 Prime Minister with absolute power. He humiliated the rival power of Austria, established the absolute supremacy of the crown, suppressed

Richelieu.

conspiracies, overawed the king, crushed the Huguenots at Rochelle, and encouraged art and letters.

Richepin, JEAN, b. 1849. French poet, novelist, and dramatist.

Richer, EDMOND, 1560–1631. French theologian, syndic of the Sorbonne 1608; deposed 1613 for his defense of Gallicanism. *De eccles. et politica potestate*, 1611, and forced to recant 1629.

Richer, PAUL, b. 1849. French alienist, writer on epilepsy and hysteria.

Richet, ALFRED LOUIS, 1816–1891. French surgeon. *Anatomie medico-chirurgicale*, 1857.

Richet, CHARLES, b. 1850. Prof. Paris; ed. *Revue Scientifique* from 1878; writer on physiology.

Richfield Springs. Fashionable resort in N. Y., 60 m. s.e. of Syracuse. It has sulphur springs, celebrated for the cure of rheumatism and cutaneous diseases. Pop., 1890, 1,623.

Richings, PETER, 1797–1871. Anglo-American actor.

Richmond. Old town of Surrey, 9 m. w. of London; noted for its park and its historic associations.

Richmond. Capital of Wayne co., Ind., on the Whitewater. Pop., 1890, 16,608.

Richmond. Capital of Madison co., Ky., scene of a battle Aug. 30, 1862. Pop., 1890, 5,073.

Richmond. Capital of Va. (since 1779) and of Henrico co., on the James, at the head of tide and navigation; chartered 1742; burned by Arnold 1781; capital C.S.A. 1861–65. The "seven days' battles," June 25–July 1, 1862, was fought near it. It has some commerce and considerable manufactures, especially of tobacco. Pop., 1890, 81,388.

Richmond, CHARLES GORDON LENNOX, 4TH DUKE OF, 1764–1820. Lord-lieut. of Ireland 1808; Gov.-gen. of Canada 1819.—His uncle, CHARLES, 1735–1806, 3d Duke, was Envoy to France 1765 and Sec. of State 1766.

Richmond, DEAN, 1804–1866. Financier; pres. N. Y. Central R.R. 1864.

Richmond, GEORGE, R.A., D.C.L., LL.D., 1809–1896. English portrait painter.

Richmond, LEGH, 1772–1827. English clergyman, of the Evangelical school. *The Dairyman's Daughter*, an immensely popular tract, formed part of his *Annals of the Poor*, 1814.

Richmond, MARGARET BEAUFORT, COUNTESS OF, ab.1440–1509. Descendant of Edward III. and John of Gaunt, mother of Henry VII.; patron of learning at Cambridge.

Richmond College. At Richmond, Va.; founded 1830–40; reorganized 1866 in 8 schools. It has near 200 students.

Richter, ÆMILIUS LUDWIG, 1808–1864. Prof. at Leipzig 1835, Marburg 1838, and Berlin 1846; writer on canon law.

Richter, CHRISTIAN FRIEDRICH, 1676–1711. Physician to Francke's institutions at Halle. Some of his hymns are much used in Germany, and in English versions.

Richter, GUSTAV KARL LUDWIG, 1823–1884. German painter, eminent chiefly for his portraits.

Richter, JEAN PAUL FRIEDRICH, 1763–1825. German novelist, notable for imagination, humor, eccentricity, and lack of literary form. Most of his romances have been translated; the chief are: *The Invisible Lodge*, 1793; *Hesperus*, 1795; *Flower, Fruit and Thorn*, 1796–97; *Titan*, 1800–3; and *Wild Oats*, 1804–5. He wrote also on *Æsthetics*, 1805–12; on education, *Levana*, 1807; and an incomplete *Autobiography*, 1826.

Richthofen, FERDINAND, BARON VON, b. 1833. German traveler and author. *Volcanic Rocks*, 1867; *China*. 4 vols., 1877–82.

Richu Mountain. In Va.; scene of a Union victory July 11, 1861.

Richweed. See CLEARWEED and HORSE-BALM.

Ricimer, COUNT, d. 472. Goth, commanding the foreign troops of Rome; known as the "King-Maker." He compelled the abdication of the Emperor Avitus 456; put Majorian on the throne 457–461; ruled through his puppet Severus 461–465; and accepted Anthemius from the Emperor Leo 467, but displaced him 472 by Olybrius.

Ricinoleic Acid, or RICINIC ACID. $C_{18}H_{34}O_3$. Thick oil, which, combined with glycerin as a glyceride, forms the main constituent of castor oil; prepared by the decomposition of this oil. A solution of the sodium salt of ricinoleic acid made by the action of caustic soda is found in trade as soluble oil, and is used in dyeing and finishing textiles.

Rickets. Disease of the bones in childhood. The mineral constituents are deficient and there is an excessive cell growth; the bones are, consequently, less rigid than when normal. Various deformities result from the consequent bending of the bones. The technical name for the condition is rachitis.

Ricketts, JAMES BREWERTON, U.S.A., 1817–1887. Brig.-gen. U. S. Vols. 1861; active in the Va. campaigns.

Ricketts, PALMER CHAMBERLAIN, b. 1856. Civil engineer and educator, Prof. of Mechanics, 1884 and, since 1892, director of the Rensselaer Polytechnic Institute.

Rickman, THOMAS, 1776–1841. English architect. *Styles of Architecture*, 1817.

Ricochet. The successive rebounding of a round shot after the first impact on ground or on the surface of water. The elongated projectiles of modern artillery are deflected upon striking but do not ricochet.

Ricord, PHILIPPE, 1800–1889. American-French surgeon, specially eminent as a pathologist; writer on ophthalmia, syphilis, and cancer.

Ricotti, CÆSAR FRANCIS, b. 1822. Italian general 1864; Minister of War 1870, 1873, 1884, and 1896.

Ricotti, ERCOLE, 1816–1883. Italian historian; prof. Turin 1846, Senator 1862.

Rictus. Space or distance on the upper jaw of Birds, from the base of the horny beak to the angle of the mouth.

Ridderstad, KARL FREDRIK, 1807–1886. Swedish novelist, lyric poet, and dramatist.

Riddle. Form of puzzle anciently popular; similar to the ENIGMA (q.v.). Examples are found in O. T. (Judges xiv. 12–18) and the Koran.

Riddle, GEORGE, b. 1853. New England elocutionist and reader.

Riddle, JOSEPH EDMOND, ab.1804–1859. Anglican divine. *Latin Dictionary*, 1836–38; *Christian Antiquities*, 1839.

Riddle, MATTHEW BROWN, D.D., b. 1836. Prof. Hartford 1871–87, and since in Western Theol. Sem.; editor of sundry Fathers and Commentaries.

Riddleberger, HARRISON HOLT, 1844–1890. U. S. Senator from Va. 1883–89; prominent as a readjuster.

Rideau. Lake in Ontario, Canada, drained by R. river into the Ottawa river; together with canals, the lake and river, Ottawa, on Ottawa River, is connected with Kingston on the St. Lawrence; this waterway was originally established for military purposes between 1826–34; length of navigation, 126¼ m.; number of locks 47; navigable depth 4½ ft.

Rider. See BALANCE.

Ridge. In Building, the line of the summit of a pitched roof, at which the rafters join. In Mediæval Architecture, it was often emphasized and decorated with a cresting of metal, wood, or baked clay; in the last case called ridge-tiles.

Ridge OF HIGH PRESSURE. Long, rather narrow region of the earth over which the barometric pressure is higher than on either side. See BELT OF HIGH PRESSURE.

Ridgway, ROBERT, b. 1850. Curator U. S. Nat. Museum 1879. Joint author with S. F. Baird and T. M. Brewer of *North American Birds*, 3 vols., 1874, and *Water Birds of N. A.*, 2 vols., 1884. American ornithologist.

Ridinger, JOHANN ELIAS, 1695–1767. German animal painter and engraver. His works as a painter are few and

The Stag, by Ridinger.

little known, but in his etchings he displays uncommon ability. He had been brought up a huntsman, and applied himself to the illustration of animal life and of the modes of the chase.

Ridings. Three divisions of the county of York. The original word was thridings, meaning thirds.

Ridley, NICHOLAS, D.D., ab.1500–1555. English martyr; chaplain to Cranmer 1537 and to Henry VIII. 1540; Bp. of Rochester 1547, and of London 1550; active as a reformer. He defended Jane Gray's title, was imprisoned 1553 on Mary's accession, and burned with Latimer at Oxford.

Ridolfo, ZENO. Name given to SCHADOW, RUDOLPH (q.v.).

Ridpath, JOHN CLARK, LL.D., b. 1840. American writer, chiefly on history and biography.

Riedesel, FRIEDRICH ADOLPH, BARON VON, 1738–1800. Hessian general, in America 1776. He fought at Ticonderoga, Stillwater, and Saratoga, surrendered with Burgoyne Oct. 17, 1777, returned to Germany 1783, and commanded the Brunswick soldiers in Holland 1787–94. His *Letters and Journals*, with those of his wife, were tr. 1867–68.

Riehl, ALOIS, b. 1844. Austrian writer on philosophy; prof. at Gratz 1873 and Freiburg 1883.

Riehl, WILHELM HEINRICH, b. 1823. Prof. Munich; novelist and historical writer.

Riehm, EDUARD KARL AUGUST, D.D., 1830–1888. Prof. Halle 1862. *Messianic Prophecies*, 1875, tr. 1890; *Introduction to O. T.*, 1888–90.

Riel's Rebellion. When the Red River settlement came under the control of Canada 1869, the Bois-Brulés, headed by Louis Riel (1844–1885), revolted and proclaimed an independent republic, but were put down by Col. Wolseley with a force of 1,400 men in Aug. 1870. In 1885 Riel led another insurrection of half-breeds in the same territory, and was executed for treason.

Riemann, GEORGE FRIEDRICH BERNHARD, 1826–1866. German mathematician. *Fundamental Hypotheses of Geometry*, 1854; *Multiple Periodic Functions*, 1857. *Works*, 1892.

Rienzi, COLA DI, 1313–1354. Political reformer; proclaimed as tribune of the Roman Republic May 19, 1347. He restored order in the city and reigned seven months, when he was driven from Rome, the populace being offended by the taxes levied, and the nobles by his arrogance. A second attempt, in Aug. 1354, was a failure, and he was slain by a mob on the steps of the Capitol.

Ries, FERDINAND, 1784–1838. German musician. *Biographischen Notizen über L. van Beethoven*, 1838. He composed three operas, two oratorios, six symphonies and many smaller pieces.

Riese, ADAM, 1489–1559. German mathematician, author of an algebraic arithmetic, 1536.

Riesengebirge. Range between Silesia and Bohemia. Length ab. 60 m., greatest ht. 5,260 ft.

Rietz, JULIUS. 1812–1877. German musician, Mendelssohn's successor 1848 as director of the Gewandhaus concerts in Leipzig, and teacher of composition at the Conservatory. He wrote four symphonies and many other works.

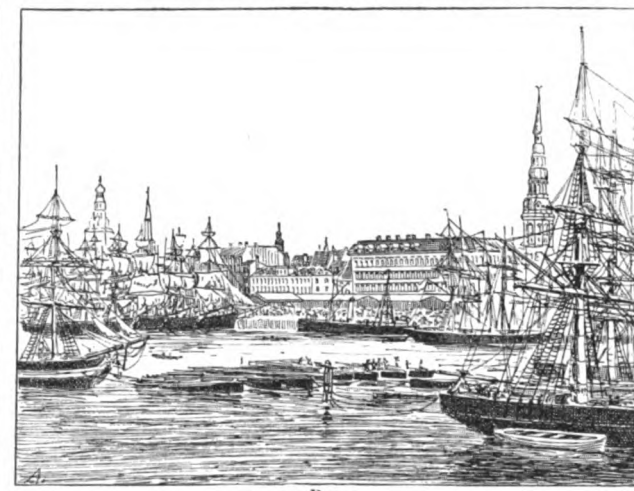
Riffle. In placer mining or gold washings, device whereby the current of water in a sluice-box or a tunnel is checked, so as to facilitate the collection of the gold or the amalgam; usually a strip of wood. Also called Riffle Bar.

Rifle, INFANTRY. Small arm whose bore is cut into spiral grooves separated by lands, so as to impart a rotary motion to the bullet. Rifling with straight grooves was used as early as 1498 in Germany, but the advantage of spiral grooves in imparting a rotary motion to the bullet, steadying its flight, and increasing the range, was an accidental discovery, probably ab.1520 or later. The rifle with spherical bullets began to be used as a military weapon ab.1600, but elongated bullets were not used until 1729. Rifles were in common use by the American soldiers during the Revolutionary War. As early as 1814 military rifles, caliber 0.53 in., were made at the Harper's Ferry arsenal, but the smooth bore continued to be the main infantry arm till 1855. In 1818, however, ten thousand breech-loading flint-lock rifle muskets, caliber 0.512 in. (Hall's pattern), were issued to the U. S. troops. The great objection, at first, to the use of the rifle as a military weapon was the difficulty experienced in loading it. The bullet had either to be driven in by a mallet or when home to be rammed so as to interlock in the grooves. This difficulty led to the introduction of the carabine-à-tige 1821, in which there was a short cylinder or steel pin at the bottom of the bore, upon which the bullet rested and which acted as an anvil when the bullet was rammed. Repeated experiments finally led to the adoption of the elongated bullet having an open conical base, which the expansion of the powder forced to take the grooves, and Captain Minie, an instructor of the school at Vincennes, in 1847 further improved this, by introducing a wrought iron cup in the base of the bullet. The Minie rifle now became the favorite infantry arm, and though never generally issued to the English army was used by them in the Caffre war of 1851 and in the Crimea in the battles of the Alma and Inkerman. This was followed by the Enfield rifle, introduced in 1855, which resulted from the improvements and alterations suggested by many experiments at Enfield, and it held its place until the adoption of the breech-loading rifle in 1867. The Prussians were the first to foresee the great advantage of the breech-loader and adopted the needle-gun in 1848, which they used with effect in the Danish war of 1864, the Austrian in 1866, and the French in 1870. The French followed with the Chassepot in 1866, an improved needle-gun, with a simpler action and smaller bore than the Prussian arm. The Germans adopted the Mauser in 1871 and the French superseded the Chassepot by the Gras, a modification of the latter, in 1874. A scientific investigation of the proper relation between the charge, the caliber and the bullet, based on the result of Prof. Bashford's experiments (begun in 1865), soon led to a marked advance in the rifle. The Martini-Henry rifle (1869) was issued to the English troops in 1871 and held for a long time the first place among military small arms. This gun was made up of a combination of the Henry barrel with the Martini breech action, and this latter was, in principle, a complete copy of the Peabody breech mechanism invented in the U. S. The development of small arms has been most rapid in recent years, owing to the introduction of metallic cartridges, and has been along the lines of smaller bore and the use of smokeless powder. The Krug-Jörgensen magazine rifle, used by the Danish troops, has been improved in many particulars and adopted as the infantry arm in the U. S. army. It is a magazine breech-loader, caliber 0.30 in. It has a magazine cut-off so that the five shots in the magazine can be held in reserve, for an emergency, and be used ordinarily as a single loader. The magazine is of the fixed type, lying horizontally under and to the left of the receiver. The bullet is of lead with nickel-steel jacket, 220 grains' weight, and is given a velocity of nearly 2,000 f.s. with a charge of 42 grains of American smokeless powder. See CHASSEPOT, ENFIELD RIFLE, MAGAZINE GUN, MINIE BALL, NEEDLE GUN, and REMINGTON RIFLE.

Rifled Guns. Modern firearms are breech-loading rifles in which the surface of the bore is cut into spiral grooves and bands, so that a rotary motion may be given to the projectile. The number of these is six times the caliber of the gun in inches; thus giving 48 for the 8 in., 60 for the 10 in., etc. To impart the angular motion gradually and to bring a minimum strain upon the gun, the twist is an increasing one, commencing with one turn in 50 calibers at the chamber and increasing to one turn in 25 calibers until a point two calibers from the muzzle is reached, and from this point to the muzzle the twist is uniform. The curve of the twist when developed upon a plane is a cubic parabola whose equation is $y^{\frac{3}{2}} = 2px$. In small arms the grooves are made as shallow as possible to facilitate cleaning of the bore.

Rifled Projectiles. The most recent device to give rifled projectiles of heavy guns the rotating motion consists of a rotating band of copper fitted into an undercut groove near the base of the projectile, having a steeper slope than that of the part of the chamber upon which it rests, so that when pushed home it is centered for firing. To facilitate its readily taking the rifling a number of grooves or cannelures are cut on the copper band. The systems of rifled projectiles for the now obsolete muzzle-loading rifles comprised the studded or flanged, and the expanding classes, and are known by the names of their inventors, as Hotchkiss, Parrott, Palliser, Butler, etc.

Riga. City and seaport of Russia, at n. end of Gulf of R.; capital of Livonia; founded ab.1200; taken by Swedes 1621, by



Riga.

Russia 1710. It has a large commerce, ranking in this respect second only to St. Petersburg. Pop., 1890, 180,278.

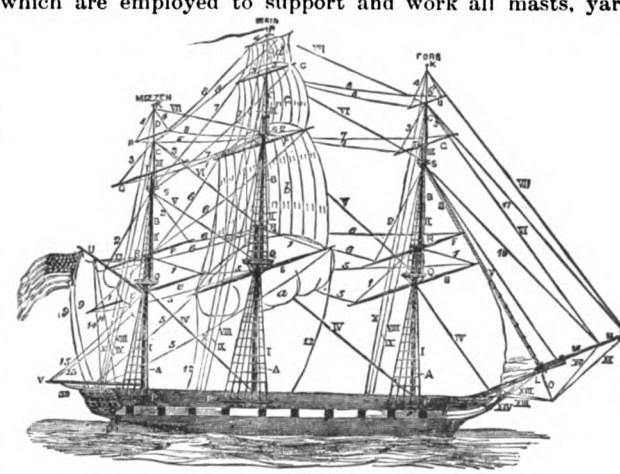
Riga, GULF OF. Arm of the Baltic, extending into Russia. Dimensions 105 m. by 60.

Rigaud, HYACINTHE. 1659–1743. French portrait painter of marked talent.—His brother, GASPARD, was also a fine portrait painter.

Rigdon, SIDNEY. 1793–1876. Copyist and editor of the *Book of Mormon;* associate of Joseph Smith in founding the sect, and elder in it; rival of Brigham Young; excommunicated 1844.

Rigg, JAMES HARRISON, D.D., b. 1821. English Wesleyan, pres. of Conference 1878–79 and 1892–93; ed. *Quarterly Review*, 1885. *Modern Anglican Theology*, 1857–79; *Wesley*, 1875–91.

Rigging. Combination of numerous ropes, chains, etc., which are employed to support and work all masts, yards,



Rigging.

Spars, etc.—A, Mast: B, Topmast: C, Topgallantmast: D, Royal-mast: E, Yard: F, Topsailyard: G, Topgallantsail-yard: H, Royal-yard: K, Truck: L, Bowsprit: M, Jib-boom: N, Flying Jib-boom: O, Martingale: P, Chains: Q, Top: R, Cap: S, Crosstrees: T, Topmast Cap: U, Gaff: V, Boom, or Spanker-Boom.
Sails.—*a*, Mainsail: *b*, Topsail: *c*, Topgallantsail: *d*, Royal: *e*, Spanker.
Standing Rigging.—I. Shrouds: II. Topmast Shrouds, crossed by Ratlings: III. Topgallant Shrouds: IV. Stays: V. Topmast Stay: VI. Topgallantmast Stay: VII. Royal Stay: VIII. Topmast Backstay: IX. Topgallantmast Backstay: X. Royal Backstay: XI. Flying Jib-boom Martingale Stays: XII. Jib-boom Martingale Stays: XIII. Martingale Backstays: XIV. Bobstays.
Running Rigging.—1, Lifts: 2, Topsail Lifts: 3, Topgallantsail Lifts: 4, Royal Lifts: 5, Braces: 6, Topsail Braces: 7, Topgallant Braces: 8, Royal Braces: 9, Signal Halyards: 10, Jib-stay: 11, Flying Jib-stay: 12, Sheet: 13, Peak Halyards: 14, Vangs: 15, Topping Lifts: 16, Spanker Sheet.

sails, etc., in a ship. Standing rigging is that which is set up permanently, as shrouds and stays. Running rigging com-

prises all the ropes hauled upon to brace yards, make and take in sail, etc., such as buntlines and halyards.

Riggs, ELIAS, D.D., LL.D., b. 1810. American missionary in Greece 1832, at Smyrna 1838, and at Constantinople since 1853; tr. Bible; author of Armenian, Bulgarian, and Turkish grammars, 1847–56.

Riggs, STEPHEN RETURN, D.D., LL.D., 1812–1883. Missionary to and writer on the Dakotas.

Right. 1. That quality of conduct which gives it moral merit and makes it obligatory. 2. Claim to liberty of action, in which either alternative open to the will may be chosen with impunity. In right as morality this impunity does not exist.

Right. In some European legislative assemblies, the conservative members, supporters of the government, have seats on the right of the presiding officer, the opposition on his left.

Right Angle. When two straight lines so intersect that the adjacent angles are equal, each is a right angle.

Right Ascension OF A STAR. Arc of the celestial equator included between the vernal equinox and the great circle drawn through the star perpendicular to the equator.

Right Conduct. That which conforms to certain precepts of duty recognized to be unconditionally binding.

Righteousness, IMPUTED. Doctrine, long prominent in Protestant theology, that Christ's merits are credited to the believer. The modern view is that they are meant to be stimulants to and producers of Christian character, not substitutes for it.

Right Figure. One in which the elements are at right angles, as in a right prism. Here the lateral edges are perpendicular to the base. In a right cone, the axis is perpendicular to the base.

Right-Handedness. This is due to lack of symmetry in the human body, the right side weighing ab. 15 ounces more than the left side.

Right Line. Straight line; opposed to curved.

Right of Way. Right enjoyed by a person or corporation of passing over land the fee of which is vested in another party. Rights may be limited both as to intervals at which they may be exercised and as to the extent authorized.

Right Reverend. Title of a bishop, of a mitered abbot, and of some other dignitaries.

Rights. Abstract possessions vested in individuals by moral rules; such as rights to liberty, to personal safety, and to property.

Rights, DECLARATION OF. Adopted in Parliament Feb. 1689, condemning the conduct of James II., and announcing his abdication. The BILL OF RIGHTS (q.v.), Oct. 1689, was of similar tenor and more voluminous.

Rights of Government. Rights possessed by the State, or by persons representing the community, to enforce the rules of human action necessary for the preservation and well-being of society.

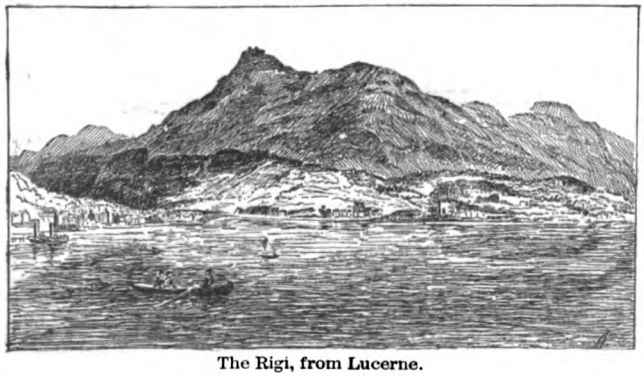
Rights of Man, DECLARATION OF. Adopted by French Assembly Aug. 1789.

Right Sphere. Celestial sphere as seen from a point on the earth's equator. All the celestial bodies appear to describe circles perpendicular to the horizon.

Right to Employment. Claim conceded by some governments, that it is the duty of the state to provide employment for those unable to find work and wages otherwise.

Right Whale. See BALEEN WHALE.

Rigi, or RIGHI. Mountain near Lake Lucerne; in Canton



The Rigi, from Lucerne.

Schwyz; noted for its fine views; ascended by two railroads, and frequented by many tourists. From the highest point, the Kulm, is seen a magnificent panorama, also the curious mirage phenomenon, "The Specter of the Rigi." Altitude 5,906 ft.

Rigidity. That of any body is determined by the force which must be applied to produce a change of shape. Fluids have none. That of a solid may be defined as the ratio of the force applied per unit area, to the shear which is produced by it. In no actual case is the rigidity perfect, and the ratio of stress to strain is sometimes called the coefficient of rigidity. The torsional rigidity of a rod or prism is the ratio of the twist per unit of length to the moment of the couple producing it. One end is supposed fixed; to the other the couple is applied perpendicular to the length of the rod. If a body be subjected to stress, producing uniform distortion, the ratio of the normal traction or pressure per unit area to twice the elongation or contraction in the direction of the stress is called the modulus of rigidity.

Rigveda. First of the four VEDAS (q.v.).

Rigor Mortis. Stiffening of a body after death, due to chemical changes in the muscles. In cases of sudden death from violence, it is not uncommon for rigor mortis to fix the body at the moment of death; this accounts for posture of many bodies on the battle field or after a railway accident: this is known as instantaneous rigor mortis. Usually, while the time of its appearance and disappearance varies greatly, it comes on from 7 to 18 hours after death and lasts for from 24 to 36 hours.

Riley, CHARLES VALENTINE, 1843–1895. Entomologist of Mo. 1868, of U. S. 1878; author of many reports and papers. *Potato Pests*, 1876; *Locust Plague*, 1877.

Riley, HENRY HIRAM, 1813–1888. Lawyer and judge in Michigan. *Puddleford Papers*, 1857.

Riley, JAMES, 1777–1840. American seaman, slave in Africa 1815–16. His *Narrative* circulated widely.

Riley, JAMES WHITCOMB, b. 1853. American dialect poet. *The Old Swimmin' Hole*, 1883; *The Boss Girl*, 1886; *Afterwhiles*, 1887; *Pipes o' Pan*, 1888; *Rhymes of Childhood*, 1890; *Neighborly Poems*, 1891; *Armazindy*, 1895.

Rime-Frost. Formation of frostwork from the air by secretion of minute globules of mist. The vapor is deposited as water and frozen after or at the moment of deposition: it is always added to the windward side of the receiving surface, and on the summits of mountains the growth is often of enormous size, owing to the strong winds. It is opaque and snowy, as contrasted with hail.

Rimini. Ancient Umbrian and Etruscan city, on the Adriatic, 69 m. s.e. of Bologna; held by Rome from 286 B.C., by the Malatestas 1237–1503, and by the popes 1528–1860. It has a fine cathedral and some remains of antiquity. The story of Francesca has been celebrated by many poets. Pop., with suburbs, ab.20,000.

Rimmer, WILLIAM, 1816–1879. American sculptor, painter, and art teacher. *Elements of Design*, 1872–79; *Art Anatomy*, 1877.

Rimose. In Botany, structures with numerous cracks or chinks.

Rim-Rock. Borders or edges of the old channels or basins in Cal., in which the large quantities of gold-bearing gravels have collected.

Rimsky-Korsakow, NICHOLAS ANDREJEWITSCH, b. 1844. Russian composer; since 1871 Prof. of Composition at the Conservatory in St. Petersburg; musical inspector of the navy; an uncompromising champion of the young Russian school. See RUSSIAN MUSIC.

Rinderpest. See CATTLE PLAGUE.

Rindfleisch, GEORG EDUARD, b. 1836. Prof. Zurich, Bonn, and Würzburg; writer on pathology.

Rinehart, WILLIAM HENRY, 1825–1874. American sculptor, noted for many bronze busts and statues.

Ring, BERNARD JAQUES JOSEPH MAXIMILIAN, 1799–1875. Alsatian antiquarian, who wrote in French on old German buildings, establishments, and usages.

Ringbone. Exostosis on the coronet of the horse. It often occurs in newly dropped foals, but is most commonly due to overwork and strains. It stiffens a horse and is practically incurable.

Ring-Canal. Encircling canal in the outer edge of the umbrella of Jelly fish, and uniting with the radiating canals from the central stomach.

Ringent. Irregular, wide-mouthed corolla of certain plants of the gamopetalous families, especially *Scrophulariaceæ* and *Labiatæ*.

Ringgold, SAMUEL, 1770–1829. M.C. from Md. 1811–15.—Of his sons, SAMUEL, U.S.A., 1800–1846, inventor of the McClelland

saddle, was killed at Palo Alto; CADWALADER, U.S.N., 1802–1867, became Rear-admiral 1866.

Ring Money. Used in ancient Egypt, and later in Europe, before the introduction of coinage, as still in parts of Africa.

Ring Puzzle. Ingenious toy, consisting of a series of rings attached to a rod from which they may be removed and replaced. Tradition ascribes its invention to the hero Hung Ming (181–234), who gave it to his wife when he went to the war, that she might forget her sorrow for his absence. In Corea this puzzle is popular under the name of Delay Guest Instrument.

Rings, SYMBOLISM OF. From earliest historic times, finger-rings are found employed as personal emblems and badges of rank. Marked with a distinguishing sign upon the bezel or enlarged part, they were used as a seal to give authenticity to writings, and delivered, as by a royal personage, as a means of delegating authority to a subordinate. In China, the jade rings, formerly used in drawing the bow, survive as insignia of military rank. A ring is given to a bishop, with his crozier, upon his consecration, as a mark of ecclesiastical rank; a bishop's ring is an amethyst; a cardinal's, a sapphire. The custom of exchanging rings as a pledge of fidelity or friendship is widespread, the wedding ring being a conspicuous survival.

Jewish Marriage-Ring.

Ring Toss. Indoor and outdoor sport. A post set firmly upon a circular wooden base is the target: at this rings of varying size are tossed, the object being to land them upon the post. The smaller rings count the most.

Ringwaldt, BARTHOLOMAUS, 1532–ab.1599. German hymnist.

Ring Worm. Name given to several diseases of the skin whose eruption is usually circular in form. When it spreads and the part first attacked heals, the resemblance to a ring is quite marked. They are communicable, are caused by the presence of one of several vegetable parasites, and frequently attack the scalp or the beard. Dermatologists are not agreed in their limitations of the use of this word. It is an object of many popular superstitions.

Rink, HEINRICH JOHANN, 1819–1894. Danish geographer and official. *Greenland*, 1877; *Eskimo Tribes*, 1887.

Rinkart, MARTIN, 1586–1649. German hymnist.

Rink-Ball. Game belonging to the roller skating rink; similar to Rink-Polo, except that no sticks are used, the ball being large and driven with the foot, so that the play amounts to a species of Association football on roller skates.

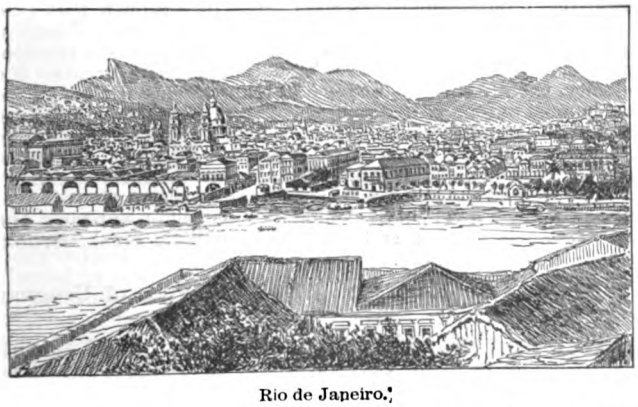
Rink-Polo. Variety of Hockey, but played on a smooth made surface within doors, the players wearing roller skates. The rules are similar to those of Hockey or Shinney as played upon ice.

Rinmann's Green. $ZnCoO_2$. Green mass, made by heating a zinc salt moistened with cobalt nitrate on charcoal.

Rio, ANDRES MANUEL DEL, b. ab.1769. Mexican mineralogist. His principal works were pub. 1790–1830.

Rio, ANTONIO DEL, 1745–ab.1789. Spanish discoverer of the ruins near Palenque, s. Mexico. His *Description* of them was pub. 1794.

Rio de Janeiro. Metropolis and capital of Brazil, a seaport on the Atlantic, with a fine harbor; founded 1566; capital of the viceroy 1763, and of the empire 1822. It has a large export trade, mainly of sugar, cotton, coffee, and hides. Pop., 1890, ab. 380,000.



Rio de Janeiro.

Rio de la Plata. River of S. America, with its branches the largest next to the Amazon. They drain nearly the entire breadth of the continent from lat. 15° S. to 35° S., an area of more than a million sq. m. It is formed by the junction of the Parana and the Uruguay, the name being applied only to the estuary below their junction.

Rio Grande. One of the large rivers of the U. S. It heads in the San Juan Mts., in Colorado, where it collects most of its waters, flows s. across New Mexico, then s.e. to the Gulf of Mexico, forming the boundary between Texas and Mexico. Its entire course is through an arid region, and though 1,800 m. long, it carries comparatively little water. Drainage area 128,792 sq. m.

Rioja, FRANCISCO DE, ab.1585–1659. Spanish poet.

Rio Negro. 1. Left hand branch of the Amazon, rising in s. Colombia; navigable for 600 of its 1,350 m. 2. River of Argentina, formerly Patagonia; rising in the Andes and flowing e. to the Atlantic. Length ab. 600 m.

Rio Pilcomayo. See PILCOMAYO.

Rio Salado. Tributary of the Parana, rising in the Andes and flowing e. and s.e. across Argentina.

Riot. At Common Law, unlawful act of violence by three or more. It is defined, and the punishment prescribed, by modern statutes.

Rio Tinto. River in Spain uniting with the Odiel a little above its mouth in the Gulf of Cadiz. Columbus set sail from the port, formed by the combined estuary, for the discovery of America. Length 70 m.

Riouw Lingga. Archipelago, at s. end of the Malay Peninsula, composed of two groups of islands, Riouw to the n. and Lingga to the s. Most of the islands are covered with thick forest and some have deposits of tin, now almost exhausted. Pop., mixed races, ab.100,000.

Riparian. Plants or animals occurring naturally along streams.

Riparian Rights. Those attending the ownership of real property bounded by natural water courses.

Ripidolite. Some of the varieties of the mineral chlorite; so called in allusion to their fan-like shapes.

Ripley, ELEAZAR WHEELOCK, 1782–1839. Brig.-gen. U.S.A. 1814; distinguished on the Canada border, especially at Fort Erie; M.C. from La. from 1835.

Ripley, GEORGE, LL.D., 1802–1880. Founder of BROOK FARM (q.v.), Mass., 1841; critic of N. Y. *Tribune* from 1849; ed. *American Cyclopædia*, 1858–63 and 1873–76.

Ripley, HENRY JONES, D.D., 1798–1875. Prof. Newton Theol. Inst., Mass., from 1826; N. T. commentator.

Ripon, FREDERICK JOHN ROBINSON, EARL OF, 1782–1859. M.P. 1806; member of several cabinets; Viscount Goderich and Premier 1827; Earl 1833.—His son, GEORGE FREDERICK SAMUEL, b. 1827, became M.P. 1852, Earl 1859, Sec. for War 1863, for India 1866, and Marquis 1871; Viceroy of India 1880–84.

Ripon College. Founded 1854 at Ripon, Wis. It has preparatory, collegiate, musical, and art departments, the second including classical, scientific, and literary courses, with 16 teachers and ab. 240 students.

Ripple Marks. Ridges like miniature waves on the surface of a stratum, produced by the oscillation of shallow water.

Rippon, JOHN, D.D., 1751–1836. Baptist pastor in London from 1773. His *Selection of Hymns*, 1787, was the most important of many supplements to Dr. Watts', and contained numerous originals by various writers: it went through many editions, and exerted wide influence.

Riprap. Loose stones used to form an embankment or jetty, or for protection of a pier.

Rip Van Winkle. Hero of a famous story by W. Irving, 1820, and of a play by Boucicault, 1865, in which Joseph Jefferson gained his chief fame.

Rishanger, WILLIAM, b. 1250. English monk of St. Alban's Abbey, author in 1312 of a chronicle extending 1259–1307.

Rishi. Poets of the Vedas.

Risley, JOHN EWING, b. 1843. U. S. Minister to Denmark 1893.

Risotto. Italian preparation of rice, onions, and butter.

Rist, JOHANN, 1607–1667. Author of ab. 680 German hymns, many of them long popular, and some known in English versions.

Ristic, JOHN, b. 1831. Servian author and state official; head of the regency 1889–93.

Ristori, ADELAIDE, b. 1821. Marchioness del Grillo 1847. Italian actress, admired in Paris 1855, and in the U. S. 1866 and 1875. Her chief parts were Mary Stuart, Queen Elizabeth, Medea, Marie Antoinette, Lady Macbeth, and Judith.

Ritchie, MRS. ANNE ISABELLA, b. 1838, m. 1877. Daughter of W. M. Thackeray; author of *Old Kensington*, 1873, *Miss Angel*, 1875, and several vols. of reminiscences.

Ritchie, THOMAS, 1778–1854. Ed. Richmond *Enquirer*, 1804–45.

Ritchie, SIR WILLIAM JOHNSTON, 1813–1892. Chief-justice of New Brunswick Supreme Court 1855, and of Canada 1879; knighted 1881.

Rite. 1. Ceremony. 2. Body of ritual, differing in different churches or countries.

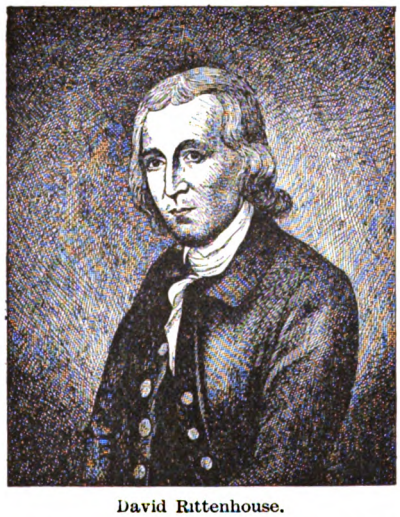
Rites, CONGREGATION OF. Created by Pope Sixtus V., 1585–90.

Ritschl, ALBRECHT, D.D., Ph.D., 1822–1889. Prof. Bonn 1853, Göttingen 1864; founder of an important school independent alike of the traditional orthodoxy and of Tübingen rationalism: it denies much, but affirms God, Christ, and redemption. His chief work is *Justification and Reconciliation*, 1870–74.

Ritschl, FRIEDRICH WILHELM, 1806–1876. Prof. at Halle 1832, Breslau 1833, Bonn 1839, and Leipzig 1865. His most celebrated work was upon Plautus, which his pupils have continued and completed. He combined precision and rare critical insight.

Ritson, JOSEPH, 1752–1803. English antiquarian, editor of old songs and poems. *Robin Hood*, 1795; *Metrical Romances*, 1802.

Rittenhouse, DAVID, LL.D., F.R.S., 1732–1796. Maker of clocks and mathematical instruments at Phila.; eminent for



David Rittenhouse.

many services to astronomy and to the State, in some of which his brother, BENJAMIN, 1740–1789, was associated.

Ritter, FREDERIC LOUIS, b. 1834 at Strassburg. Composer, conductor, and writer on the history of music.

Ritter, HEINRICH, 1791–1869. Prof. Berlin 1824, Kiel 1833, and Göttingen from 1837. *Hist. Philosophy*, 12 vols., 1829–55; *Christian Philosophy*, 1858–59.

Ritter, KARL, 1779–1859. Prof. Berlin 1820; author of *Geography, Nature, and Man*, 19 vols., 1817–59, and other valuable geographical works. *Palestine*, 4 vols., tr. 1866.

Ritteric Rays. Ultra-red parts of the solar spectrum.

Ritter's Pile. Constructed 1803; differing from the pile of Volta only in the fact that all the plates were of copper, alternating with disks of moistened cardboard. On connecting this with the Volta pile, Ritter found that it became charged and was capable of producing an inverse current. Volta (1805) explained correctly the result as depending upon the decomposition of the electrolyte between the plates, as due in fact to the polarization of the electrodes.

Rittinger, PETER, RITTER VON, 1811–1872. Austrian mining engineer, inventor, and author of many papers on mining and ore-dressing machinery. His *Lehrbuch der Aufbereitungskunde*, 1867, was a standard authority.

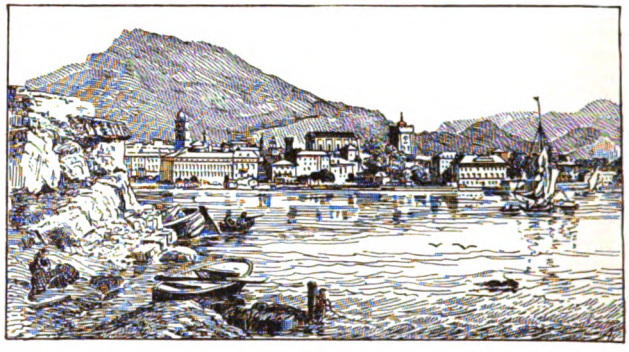
Rittingerite. Rare mineral, found in Bohemia and Hungary, containing silver, arsenic, and selenium.

Ritual OF THE DEAD. See BOOK OF THE DEAD.

Ritual, ROMAN. Set forth by Paul V. 1614, to enforce uniformity of usages in R. C. service. Many different forms had previously been in use.

Ritualism. Effect of the Anglo-Catholic, Puseyite, or Tractarian movement in the English and P. E. Churches, in emphasizing fullness and propriety of rite. Services in general are more carefully planned and conducted, and more largely musical, than before 1850; but the motives for this are often æsthetic or utilitarian, and have little to do with Tractarian or Catholic doctrine.

Riva. Winter resort in the Tyrol at the n. extremity of Lago di Garda. It has a castle, and some monasteries. Its



Riva.

port is the largest on the lake and its vicinity furnishes tropical fruits in abundance. Pop. ab.6,000.

Rivadavia, BERNARDINO, 1780–1845. Pres. of Argentina 1826–27; exiled 1834.

Rival Commodities. Commodities capable of fulfilling the same function, one or another of which will be used according as it can be provided most cheaply.

Riva Palacio, MARIANO, 1803–1880. Premier of Mexico 1851; defender of Maximilian 1867; one of the first and purest of Mexican statesmen.

Rivarol, ANTOINE, 1753–1801. French satirist and royalist pamphleteer, in exile from 1792. *Langue Française*, 1784; *Petit Almanach*, 1788.

River. Agency by which the surplus rainfall is collected and carried back to the sea. Its source of supply is rain and melted snow, either directly or by means of springs. Its volume depends upon its drainage area, the rainfall, and the proportion of the latter which reaches the stream. The last factor varies with the slope of the ground, the character of the soil and vegetation, and the aridity of the atmosphere, ranging from 10 to 65 per cent of the rainfall. The variability of flow of the stream depends on the character and distribution of the rainfall and the surface and vegetation of the drainage basin. The maximum flow is often in cases of small rivers 10 to 20 times the ordinary flow. The velocity of current depends upon the slope of the bed and the volume. It is greatest in midstream, and least near the banks and bottom. The slope of the river's bed is normally greatest near its head and diminishes toward its mouth, and every river tends to establish this profile. Lakes and waterfalls upon its course are ephemeral features. Rivers are the most efficient of the agents of erosion, transportation and deposition of detritus. The greater the velocity, the greater its erosive and transporting power. Erosion is most extensive on the upper waters of the stream, where the slope is greatest and deposition takes place mainly in its lower course and at its mouth. A delta is a deposit of detritus near its mouth, through which by several channels the river finds its way to the sea. A bar is a deposit across the mouth, where the river's velocity is suddenly checked on entering the sea. A small stream is known variously as creek, brook, branch, fork, prong, etc.

Rivera, JOSÉ FRUCTUOSO, 1790–1854. Pres. of Uruguay 1830–35 and 1838–42.

River and Harbor Improvements. In U. S. this work is in charge of the Corps of Engineers of the army. The country is divided into five sections, the Northwest, Southwest, Northeast, Southeast, and Pacific, each in charge of a Colonel or senior officer. These sections are subdivided into ab. 50 districts, each in charge of an officer who is assisted by other

officers and by civilians. The first appropriation by Congress for this work was $9,500 in 1820. The total amount expended 1820–94 was $262,845,900. The largest annual appropriation was $25,136,300 in 1890 for 436 separate rivers and harbors.

River Engineering. Improvement of navigable streams by dredging, dams, and locks. In U. S. this work is in charge of the Corps of Engineers, U. S. Army.

River Hydraulics. Flow of water in rivers, determined by actual gauging or by computations. Only the simplest case of uniform permanent flow is well understood. If a be the area of cross-section, r the hydraulic radius, s the slope, and q the discharge, then $q = ca\sqrt{rs}$, where c is a number depending largely upon the roughness of surface. For a small rise of one per cent of the total depth the velocity increases 0.5 per cent and the discharge increases 1.5 per cent.

River Pollution. Rivers whose water has been polluted tend to purify themselves by deposition and aeration, but this should not be relied upon as effective. Polluted streams whose water is used for the supply of cities and towns are always suspicious, if not dangerous. Pollution can be prevented only by legal enactments; in Europe these are often very stringent. In U. S. many States have such laws but their enforcement is difficult.

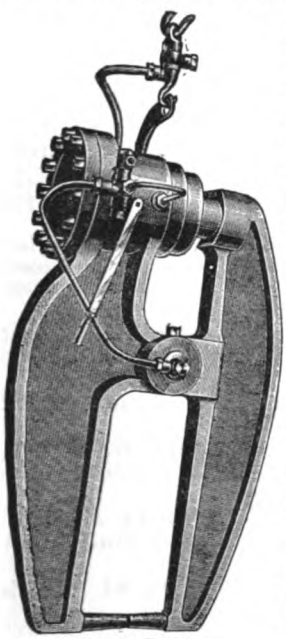
Rivers, RICHARD HENDERSON, D.D., 1814–1894. Educator in M. E. Ch. South. *Mental Philosophy*, 1860.

Rivers, RICHARD WOODVILLE, EARL, d. 1469. Father-in-law of Edward IV.; knighted 1425; Baron 1448, Earl 1466; executed, as was his son ANTHONY in 1483.

River-Weed. Insignificant aquatic herbs of the genus *Podostemon*, natural family *Podostemaceæ*, of wide geographical distribution.

Rives, AMÉLIE. See CHANLER, MRS. She became Princess Troubetzkoy 1896.—Her grandfather, WILLIAM CABELL, 1793–1868, was M.C. from Va. 1823–27, U. S. Senator 1833–34 and 1835–45, and Minister to France 1829–32 and 1849–53.

Riveters. Machines for riveting by power instead of by hand (see RIVETING). There are four types: lever, steam, hydraulic, and air machines. All have an abutment or stake which holds a cup or swage to resist the pressure brought by a moving die or ram against the red-hot rivet in place in the seam. The stake is inside the cylinder or other work being operated on, the pressure coming on the outside. The differences are in the way in which power is applied to the moving ram. The lever machines force the ram forward by an elbow-joint combination of links, whose stationary point is the back of the machine, and the links are straightened out by a ram revolving under the joint of the links which hang down when the ram is back. The objection to this type of machine is the constant travel of the ram, so that varying thickness of work can be handled only by changing the dies or swages. This has been remedied by putting the abutment joint of the links on a hydraulic plunger connected with an ACCUMULATOR (q.v.), so the heading pressure cannot exceed the accumulator load, and pins between the plates are avoided. In steam riveters the ram is moved forward by a steam piston of large area, operated by steam of ordinary pressure; in hydraulic riveters a small plunger is protruded by high pressure of water from an accumulator directly, or in portable machines, to increase lightness, the hydraulic piston works a toggle-joint. The steam riveters act with a rapid impact followed by pressure; in hydraulic riveters there is no impact, but pressure only. In many of the best ones, the plate is pressed and held together by an annular die before the heading is done by a second inner die, so that no pin may be forced between the sheets. The air riveters act either by air pressure on a cylinder operating a toggle-joint, or else by a rapid series of blows from a small cylinder operated like a rock-drill. Air riveters are adapted for work in winter in open bridge sheds, where condensation or freezing would be against the other types.



Steam Riveter.

Riveting. Operation of uniting plates of metal by lapping one part over another, and inserting, through holes which match as the parts are superposed, what are known as rivets. These are short cylinders of the same metal as the plates, with a head on one end, which are passed red-hot through the holes, and are then headed over, either by hand or by machine (see RIVETER). In hand riveting, a heavy sledge is held against the formed head, and two men with alternating blows of their hammers upon the protruding shank upset it and form an overlapping cone, which is the other head of the rivet. The contraction of the rivet as it cools, moreover, makes a stronger and tighter joint than any other, at less cost and with better resistance to fire and to corrosion. Riveted seams are single-riveted or double-riveted, according as one or two rows of rivets are used parallel to the joint. In chain riveting the holes are staggered, and not one behind the other. The aim is to get the shearing strength of the aggregate rivet area of the joint equal to the tensile strength of the plate when diminished by the holes, but in boilers and tanks usually the rivet area is in excess, to make the joint water- or steam-tight. Riveted joints are lap or butt. In the latter, the plates butt, and a welt or cover-piece is riveted to both. Where two cover-strips are used, the strain passes through the axis of the sheets without a tendency to flex. The relative strengths are usually rated thus: Original plate, 100 per cent; double riveted butt, 76 to 80 per cent; double riveted lap, 70 to 75 per cent; single riveted lap, 56 to 62 per cent. The usual sizes are $\frac{3}{4}$, $\frac{7}{8}$, and 1 in. in diameter.

Riviera. Coast of Italy from Spezia w.; usually including also that of France to Nice; famous and highly popular as a winter resort. It is divided into the eastern and western section at Genoa. The western is the mildest, most frequented, and also has the most beautiful scenery.

Riviera on the Taggia.

Rivière, BRITON, b. 1840. English painter, chiefly of animals; R.A. 1881; widely known through engravings.

Rivington, JAMES, 1724–1802. Tory journalist in New York, prominent before and during the British occupation. Rivington's *N. Y. Gazetteer*, 1773, *Loyal Gazette*, 1777, *Gazette and Universal Advertiser*, 1783.

Rivoli. Village of n. Italy, 12 m. n.w. of Verona. Near it the Austrians defeated the French Nov. 17, 1796, and were defeated by Bonaparte Jan. 14–15, 1797.

Rivulariaceæ. Family of *Cyanophyceæ* or blue-green *Algæ*, comprising forms with filaments divided by transverse septæ, their two ends being quite different, one consisting of a globose cell, the other of a terminal hair.

Rix-Dollar. Former coin of Sweden and some other countries, varying in value from ab. 38 cents to $1.10.

Rizzio, or **Riccio,** DAVID, 1540–1566. Page, secretary, and favorite of Mary Stuart; hated by the Reformers, and by some regarded as her paramour; assassinated by a conspiracy of Scottish nobles.

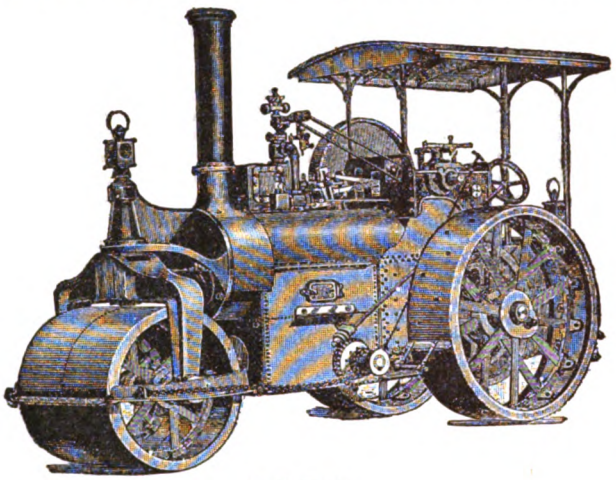
Roach, JOHN, 1815–1887. Irish-American shipbuilder.

Road Law. Body of rules applicable to persons using a public highway either on land or sea.

Road Locomotives. For use on common roads; made in France by Cugnot 1770, in England by Murdock 1782, and in U. S. by Evans 1799. Numerous inventions in this direction have been patented, but none has proved financially successful.

A boiler supplies steam to one or two cylinders, and the shaft of such engine is connected by tooth or chain gearing to the driving wheels. These latter are fitted with a very broad tire, to distribute the weight and prevent rutting of soft earth, the tire having grooves to increase adhesion and to avoid difficulties from small inequalities of surface. The front end or truck is pivoted to serve as steering apparatus. There is usually a DIFFERENTIAL GEAR (q.v.) on the drivers to enable them to turn easily. Such machines have also been applied for heavy plowing, with a number of plows abreast or en echelon, on prairie or large colonial farming. See AGRICULTURE.

Road Roller. Heavy cylinder driven by steam power or drawn by horses for consolidating the surface of a road. The



Road Roller.

heaviest weigh from 15 to 20 tons and cost ab. $6,000. A macadam road should be rolled from 50 to 100 times during the process of construction, to form a first-class pavement.

Roads. A road should be so located that the distance may be short and the grade low, but grade is more important than distance. Old roads were usually too steep. Toll roads were introduced in England ab. 1400. Road improvement began in France ab. 1750; the labors of McAdam and Telford ab. 1800–1820 did much to influence road-construction in Great Britain. Since 1880 the movement for good roads in U. S. has produced much improvement through the introduction of better methods of administration. Road construction is the simplest problem in civil engineering, and the presence of poor roads is always an indication that no engineering talent is employed upon them. The common methods of repair by scraping the mud of the gutters upon the road surface is an extravagant waste of money; a good road can never be made by this process. Broken stone coverings, well rolled, constructed under the supervision of an engineer, form a far more durable and economical surface. In N. Y. during 1893 the repair of common roads cost $2,716,000, nearly all of which was practically wasted. The appointment of road commissioners in several States has proved most advantageous in improving the condition of the public highways. See MACADAM ROAD and PAVEMENTS.

Roanoke. City of R. co., Va., on the R.; chartered 1884. Its rapid recent growth is due chiefly to iron industries. Pop., 1890, 16,159.

Roanoke College. At Salem, Va.; founded 1853. It has ab. 175 students.

Roanoke Island. On N. C. coast; settled by Sir Walter Raleigh unsuccessfully 1585. Gen. Wise with three forts and 2,500 men surrendered here to Gen. Burnside Feb. 8, 1862.

Roanoke River. In Va. and N. C. It heads in the Blue Ridge, flows generally s.e. to the head of Albemarle Sound, and is navigable to Weldon, N. C. Drainage area 9,237 sq. m., length 250 m.

Roaring Forties. Region of the Southern Ocean lying s. of 40° S. lat., especially s. of 45°, where there are strong w.n.w. and n.w. winds. The term is used by sailors, and is also applied to the region in the N. Atlantic.

Roasting. Consists in exposing the material to be treated to a temperature above the average red heat with access of air. It is done to render the material more friable, as in ore which contains a quartz gangue, more permeable to gases, or to drive off volatile elements as water and sulphur. When limestone is heated it is called calcination.

Robbery. At Common Law, open and violent larceny from the person, a capital felony; but modern statutes must be consulted for its definition and punishment in each jurisdiction.

Robbing. In Coal Mining, process of working away, as far as possible without extreme danger, the pillars or other blocks of coal that had been left standing at an earlier stage of the operations to prevent a premature falling in of the overlying rock.

Robert II., 1316–1390. Grandson of Bruce; Regent of Scotland 1338–41; King 1371; founder of the Stuart dynasty.

Robert II

Scotland was invaded by the English 1384–85, and retaliated 1388.—His son, ROBERT III., ab. 1340–1406, succeeded 1390. His realm was invaded 1400, and his army overthrown at Homildon Hill 1402.

Robert II., OF NORMANDY, d. 1035. Duke 1028; capable and ruthless sovereign; father of William I. of England.

Robert, LOUIS LEOPOLD, 1794–1835. Swiss painter.

Robert College. Founded 1863 at Constantinople by Americans; named from its benefactor, C. R. Robert, 1802–1878. It has done much for Christian education in that region.

Robert-Fleury, JOSEPH NICOLAS, 1797–1890. French painter, as is his son TONY, b. 1838.

Robert le Diable. See DAMIENS.

Robert of Brunne. Translator of French poem, *Manuel des Pèchés*, 1303.

Robert of Gloucester. 13th century. Metrical chronicler of early British affairs. His work was pub. 1724.

Roberts, BENJAMIN STONE, U.S.A., 1811–1875. Brig.-gen. U. S. Vols. 1861–65; inventor of a breech-loading rifle.

Roberts, CHARLES GEORGE DOUGLAS, b. 1860. Canadian poet and novelist; prof. at Windsor, N. S., 1885–96. *In Divers Tones*, 1887; *Songs of the Common Day*, 1893; *Earth's Enigmas*, 1896; *Forge in the Forest*, 1897.

Roberts, DAVID, 1796–1864. Scottish painter, chiefly of buildings; R.A. 1841. *Spain*, 1837; *Holy Land*, 4 vols., 1842–49; *Italy*, 1859.

Roberts, EDMUND, 1784–1836. First U. S. diplomatic agent in Asia. *Embassy to Eastern Courts*, 1837.

Roberts, ELLIS HENRY, LL.D., b. 1827. M.C. from N. Y. 1871–75; Asst. U. S. Treas. at N. Y. 1889–93. *Revenue*, 1884; *Empire State*, 1887.

Roberts, ISAAC PHILLIPS, b. 1833. Prof. Iowa Agricultural Coll. and Cornell Univ.; director of Cornell Univ. Agricultural Experiment Station.

Roberts, JOSEPH JENKINS, 1809–1876. Pres. of Liberia 1849–53 and 1871–75.

Roberts, ROBERT RICHFORD, 1778–1843. M. E. bishop 1816; active in western missionary work.

Roberts, SOLOMON WHITE, 1811–1882. Civil engineer, active in constructing railways in Pa.

Roberts, SIR WILLIAM, F.R.S., b. 1830. English physician and medical writer.

Roberts, WILLIAM HENRY, D.D., LL.D., b. 1844. Prof. Lane Sem. 1886–93; clerk Presb. Gen. Assembly from 1884. *Hist. Presb. Ch. in U. S.*, 1888.

Roberts, WILLIAM MILNOR, 1810–1881. Chief engineer Northern Pacific Railway 1870; Pres. American Soc. of Civil Engineers 1879.

Roberts of Kandahar, FREDERICK SLEIGH ROBERTS,

LORD, b. 1832. Anglo-Indian general, made famous by brilliant campaigns in Afghanistan 1878–80, culminating in the relief of Kandahar; knighted 1879, Baronet 1881, Baron 1892; commander in India 1885–93, in Ireland 1895.

Robertson, FREDERICK WILLIAM, 1816–1853. Minister of Trinity Chapel, Brighton, Eng., from 1857; greatest preacher of his time. His fame was merely local during his life, but his *Sermons*, 5 vols., 1855–63, showed rare insight into spiritual truth, and his *Life and Letters*, 1865, revealed a character of singular manliness, purity, and beauty. These, with his *Lectures and Addresses*, 1858, were eagerly read, and exerted a wide and deep influence. He was a solitary figure, disdaining connection with any party: his views resembled those of F. D. Maurice, but his power was more immediately and generally felt in the English Ch., and far beyond, than that of any other leader of liberal thought. *Lectures on Corinthians*, 1859; *Notes on Genesis*, 1877.

Robertson, GEORGE CROOM, 1842–1892. Prof. Univ. Coll., London, from 1866; ed. *Mind*, 1876–91; *Hobbes*, 1886; *Philosophical Remains*, 1893.

Robertson, JAMES, ab.1710–1788. British general; Gov. of N. Y. 1780–83.

Robertson, JAMES, 1742–1814. Pioneer and Indian fighter, prominent with Sevier in the settlement of Tenn.; General U.S.A. 1790–96.

Robertson, JAMES, D.D., b. 1840. Missionary in Syria 1864–75; prof. Glasgow 1877. *Early Religion of Israel*, 1889; *The Psalms*, 1894.

Robertson, JAMES CRAIGIE, 1813–1882. Canon of Canterbury 1859; Prof. King's Coll., London, 1864–74. *Hist. Ch. to Reformation*, 8 vols., 1853–75.

Robertson, JOSEPH, LL.D., 1810–1866. Scottish antiquarian.

Robertson, THOMAS WILLIAM, 1829–1871. English playwright. *Garrick*, 1864; *Society, Ours, Caste, Play, School, Home, Dreams, M.P.*, 1865–70; *Works*, 1889.

Robertson, WILLIAM, D.D., 1721–1793. Scottish historian; pastor at Edinburgh from 1759, and principal Univ. Edinburgh 1762. His *Scotland*, 1758–59, and *Charles V.*, 1769, were long valued. *America*, 1777; *India*, 1791.

Robert the Bruce. See BRUCE, ROBERT.

Roberval, GILES PERSONNE DE, 1602–1675. French mathematician, who claimed to have preceded Cavalieri in inventing the method of Indivisibles; best known for his treatment of tangents.

Robeson, GEORGE MAXWELL, 1827–1897. Sec. U. S. Navy 1869–77; M.C. from N. J. 1879–83.

Robespierre, MAXIMILIEN MARIE ISIDORE, 1758–1794. Leader in the French Revolution, lawyer, enthusiast and theorizer; member of the Constitutional Assembly; head of the Jacobins; member of the National Convention for Paris 1792, leader of the Radicals or Mountain; as pres. of Committee of Public Safety, he inaugurated the Reign of Terror, destroyed the King, the Girondists, his own party opponents, and was virtual dictator till accused of tyranny, condemned unheard, and guillotined.

Maximilien Robespierre.

Robin, or RED-BREAST. 1. *Merula migratoria.* Well known American thrush, length 10 in. It appears in Feb. ab. lat. 40° N., and nests in May, two broods being raised. It feeds principally on earth worms, grasshoppers, and in Oct. on cedar berries. It goes s. in Nov. 2. *Erythacus rubicola*, English Robin, length 5½ inches, belonging to the Warbler family.

Robin, CHARLES PHILIPPE, 1821–1885. Prof. Paris from 1847; Senator 1875; ed. *Journal de l'anatomie et de la physiologie* 1864–85. *Traité du microscope*, 1871.

Robin, CLAUDE, b. ab.1750. French botanist. *Voyages dans La., Fla.*, etc., 1802–6.

Robin Goodfellow, or PUCK. Fairy of English legends, exploited in *Midsummer Night's Dream.* See PUCK.

Robin Hood. Legendary English outlaw, robbing the rich and helping the poor; hero of many ballads from ab. 1380.

Robins, BENJAMIN, 1707–1751. English engineer and physicist. His *Gunnery*, 1742, had great effect.

Robinson, CHARLES, 1818–1894. Gov. of Kansas 1856 and 1858–59.

Robinson, CHARLES SEYMOUR, D.D., LL.D., b. 1829. Presb. pastor in New York from 1870; compiler of several popular hymnals.

Robinson, CONWAY, 1805–1884. Va. jurist. *Principles and Practice*, 1855–75.

Robinson, EDWARD, D.D., LL.D., 1794–1863. Ed. *Biblical Repository*, 1831–35, and *Bibliotheca Sacra*, 1843; tr. Gesenius' *Hebrew Lexicon*, 1836; prof. Union Theol. Sem., N. Y., from 1837. *Lexicon N. T.*, 1836. His *Biblical Researches in Palestine*, 1841–56, is an important work.—His wife, THERESE ALBERTINE LUISE, 1797–1869, daughter of Prof. L. H. von Jacob of Halle, m. 1828, wrote several books in German and English.

Robinson, EZEKIEL GILMAN, D.D., LL.D., b. 1815. Prof. Rochester Theol. Sem. 1853, pres. 1860; pres. Brown Univ. 1872–90. *Yale Lectures*, 1883; *Morality*, 1888.

Robinson, GEORGE DEXTER, 1834–1896. M. C. 1877–83; Gov. of Mass. 1883–86.

Robinson, HENRY CRABB, 1775–1867. English lawyer, retired 1828. *Diary, Reminiscences, and Correspondence*, 1867.

Robinson, HORATIO NELSON, 1806–1867. American author of a series of mathematical text-books.

Robinson, JOHN, ab.1575–1625. English separatist 1604, pastor of the Pilgrim Fathers at Leyden 1609; author of several treatises, and of a memorable saying, "God hath yet more light to break forth out of his Holy Word." *Works*, 3 vols., 1851.

Robinson, JOHN CLEVELAND, U.S.A., 1817–1897. Brig.-gen. U. S. Vols. 1862; distinguished in the Va. campaigns and at Gettysburg; Major-gen. 1869; Lieut.-gov. of N. Y. 1872.

Robinson, LUCIUS, LL.D., 1810–1891. Gov. of N. Y. 1876.

Robinson, MONCURE, 1802–1889. Civil engineer; locator of the first railroads of Pa.; chief engineer Phila. and Reading R. R.

Robinson, ROBERT, 1735–1790. Baptist pastor at Cambridge from 1759; tr. Saurin's *Sermons*, 1774–84; author of "Come Thou Fount," 1758, and other hymns. *Arcana*, 1774; *Hist. Baptism*, 1790.

Robinson, SOLON, 1803–1880. American journalist. *Hot Corn*, 1853.

Robinson, STUART, 1814–1881. Presb. pastor and journalist in Ky.

Robinson, WILLIAM ERIGENA ("RICHELIEU"), 1814–1892. Irish-American journalist, M. C. from N. Y. 1867–69 and 1882–85.

Robinson, WILLIAM STEVENS ("WARRINGTON"), 1818–1876. Journalist, influential in Mass. *Parliamentary Law*, 1875; *Pen Portraits*, 1877.

Robinson's Anemometer. See ANEMOMETER.

Robison, JOHN, 1739–1805. Prof. Edinburgh 1774. *Mechanical Philosophy*, 1822.

Rob Roy (ROBERT MACGREGOR), 1660–1734. Scottish outlaw, who joined the Pretender 1715, celebrated by Scott.

Robsart, AMY, ab.1532–1560. Wife of Dudley, afterward Earl of Leicester, by whom she is said to have been murdered.

Robson, FREDERICK (BROWNHILL), 1821–1864. English actor, eminent in burlesque.

Robson, STUART, b. 1836. American actor.

Roburite. Flameless explosive patented by C. Roth in 1887. It is composed of a mixture of ammonium nitrate and purified chlorinated dinitrobenzene. It must be used dry and is not sensitive to shock.

Robusti, JACOPO. See TINTORETTO.

Roby, HENRY JOHN, b. 1830. Sec. to Schools Commissions 1864–75; M.P. 1890. *Latin Grammar*, 1871–74.

Roc (RUC). See ÆPYORNIS.

Roca, JULIO, b. 1843. Pres. of Argentina 1880–86.

Rocafuerte, VICENTE, 1783–1847. Pres. of Ecuador 1835–39; publicist.

Roccellin. $C_{20}H_{12}N_2O_4SNa$. Sodium salt of the acid, formed by action of the diazo compound of naphthionic acid upon α-naphtholsulphonic acid; brown powder. It dyes wool red in an acid bath.

Roccus. See ACANTHOPTERI and BASS.

Rochambeau, JEAN BAPTISTE DONATIEN DE VIMEUR, COMTE DE, 1725–1807. French general; sent with 6,000 soldiers to America, where he rendered valuable help, especially at Yorktown; Marshal 1791; imprisoned by Robespierre 1793, when he narrowly escaped the guillotine. *Memoires*, 1809, tr. 1838.—His son, DONATIEN MARIE, 1750–1813, became Lieut.-gen. 1792, was Gov. of St. Domingo 1796 and 1802–3, and long in prison in France and England.

Rocha Pitta, SEBASTIAO DA, 1660–1738. Historian of Brazil 1730.

Rochdale. Manufacturing borough of Lancashire, Eng., on the Roche, 11 m. n.e. of Manchester. Its leading product is woolen goods. Pop., 1891, 71,458.

Rochdale Pioneers. Group of workingmen who opened a little store on a co-operative basis in 1846, and, achieving great success, have become the classical example and model for co-operative distribution.

Rochefort, HENRI (VICTOR HENRI, MARQUIS DE ROCHEFORT-LUÇAY), b. 1832. Parisian journalist, founder of *La Lanterne*, 1868, and other radical papers; Deputy 1869; repeatedly condemned; deported 1871 to New Caledonia, whence he escaped 1874; in exile till 1880; supporter of Boulanger 1888. *Mes Aventures*, 1896.

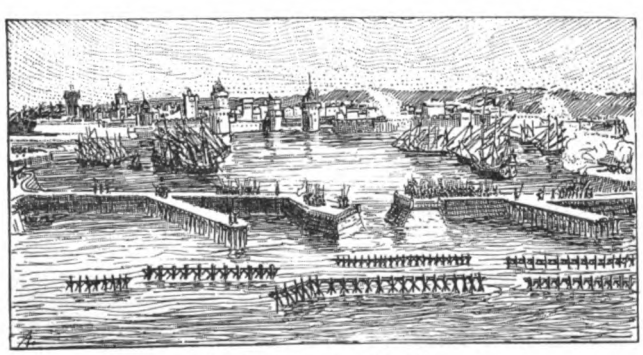
Rochefort-sur-Mer. French seaport, on the Charente, 9 m. from the Atlantic; founded 1665 as a naval station; fortified by Vauban. Pop., 1891, 33,334.

Rochefoucauld. See LA ROCHEFOUCAULD.

Rochefoucauld-Liancourt d'Estrissaè, FRANÇOIS ALEXANDRE FRÉDERIC, DUC DE LA, 1747–1827. French Lieut.-gen. 1790; in U. S. 1794–97; Peer 1815; founder of the first savings-bank in Paris; noted for benevolence. *Voyage*, 8 vols., 1795–97.

Rochejacquelein. See LA ROCHEJACQUELEIN.

Rochelle, LA. Seaport of w. France, on the Atlantic. As a Huguenot stronghold of the Calvinist party, vainly besieged by Anjou 1573; taken by Richelieu 1628, after a 14



The Harbor of La Rochelle.

months' siege. The fortifications are 3½ m. round, with seven gates and three towers, the oldest dating from 1834, and the lantern tower having seven stories. Vauban constructed the present fortifications. Pop., 1891, 26,800.

Rochelle Salt. COONa.CHOH.CHOH.COOK. Sodium potassium tartrate; white crystalline solid, soluble in water; prepared by neutralizing cream of tartar with soda; used in dyeing and in pharmacy.

Roches Moutonnées. Name given by Swiss peasants to the rounded, smooth, hummocky bosses and undulating surfaces of rock, occurring in glacial regions. When seen from above they resemble a flock of sheep lying down.

Rochester. City of Kent, on the Medway, 29 m. e.s.e. of London; seat of a bishopric since 604. Pop., 1891, 26,170.

Rochester. City of Monroe co., N. Y., on both banks of the Genesee; settled 1812; chartered 1817 and 1834. It has communications by means of 8 railroads, and has a large trade and extensive manufactures, especially of clothing and shoes. Pop., 1890, 133,896.

Rochester, JOHN WILMOT, EARL OF, 1648–1680. English lyric poet, noted for wickedness and wit, but chiefly through Bp. Burnet's account of his late repentance.

Rochester (N. Y.), UNIVERSITY OF. Founded 1850. It has four courses of study, 15 instructors, 185 students, and an endowment of ab. $1,200,000.

Rochester (N. Y.) **Theological Seminary.** Baptist; established 1850. It has 10 professors and ab. 100 students.

Rochet. Surplice without sleeves, worn by bishops.

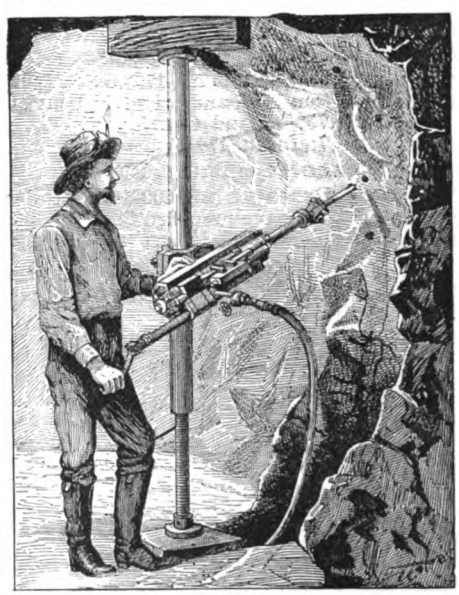
Rochet, LOUIS, 1813–1878. French sculptor.

Rock Breaker. Machine in which blocks of rock or ore are reduced in size by being subjected to a crushing action between powerful movable jaws, or between a movable jaw and a fixed surface.

Rock-Butter. Butter-like alum efflorescence oozing from alum shale. See ALUNITE.

Rock Crystal. Transparent, glassy quartz, free from color or nearly so, whether distinctly crystallized or not; used largely in jewelry and in the manufacture of ornaments.

Rock Drill. Mechanical contrivance of some kind, adapted for boring holes in rock in any desired direction, whether for blasting or for prospecting purposes, and driven by some power other than hand-power. The two prominent types are distinguished as percussion drills and rotary drills; of each many different styles and patterns have been used.



Rock Drill.

In underground mining compressed air has been the principal motive power employed, though the application of electricity has increased in recent years. The first American percussion drill (Couch's) was patented 1849; the earliest European drill (Cavé's) dates from 1851; and the extensive use of diamonds in rotary drills began with Leschot's invention of 1863. See DIAMOND DRILL and ELECTRIC DRILL.

Rocker. Piece of apparatus used in washing gold-bearing sands, the material to be washed being treated in small quantities at a time, and subjected to an oscillatory shaking, while a current of water carries away the light and worthless portions; a cradle.

Rocket. Cylindrical paper or metal case containing a slow burning gunpowder composition, conically bored around the axis, so that when ignited a great volume of gas escapes through suitably arranged vents at the base, and by its reaction against the head of the rocket sets it in motion. Congreve's rocket has a stick attached to give steadiness of flight. Hale's rocket is maintained in its flight by imparting a rotary motion about its axis: this is accomplished by three or more subsidiary vents placed obliquely to the axis. Hale's war rockets were adopted in the U. S. Service ab. 1855, but are now discarded.

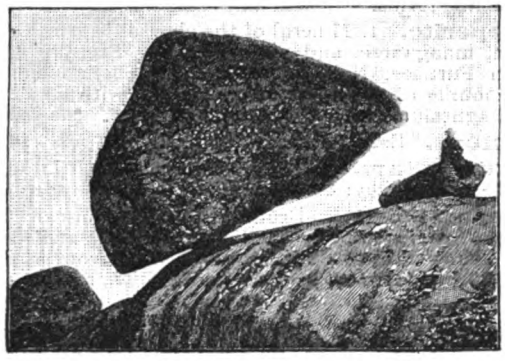
Rock Fill Dam. Dam formed by dumping rocks of all

sizes so as to make an embankment across a stream. It has the advantage of cheap construction where rock is abundant, and usually its strength and tightness increases with age.

Rockford. Capital of Winnebago co., Ill., on Rock River; founded 1836, chartered 1852, enlarged 1890. Pop., 1890, 23,584.

Rockingham, CHARLES WATSON WENTWORTH, MARQUIS OF, 1730–1782. Whig leader; Prime Minister 1765–66 and 1782; repealer of the Stamp Act 1766.

Rocking Stones, or LOGANS. Druidical stone, often of an immense size, so placed and accurately adjusted on another



Rocking-stone of Tandil, Argentine Republic.

stone as to rock at the slightest touch. They are common in Brittany, France, and Cornwall, England.

Rock Island. Capital of R. I. co., Ill., on the Mississippi. Pop., 1890, 13,634. The adjoining island has a U. S. arsenal and armory.

Rock Oil. See PETROLEUM.

Rock River. Branch of the Mississippi in s. Wis. and n. Ill. Length 386 m., drainage area 9,792 sq. m., average flow 9,944 cu. ft. per second.

Rock Rose. Widely distributed shrubs of the genus *Helianthemum*, natural family *Cistaceæ*, many of them bearing very showy yellow flowers and cultivated for ornament.

Rock Salt. Common SALT (q.v.) as found in nature. See SODIUM CHLORIDE and HALITE.

Rock Soap. Mineral substances of a clay-like aspect and consistency, which soften in water and have an unctuous feel; product of the alteration and decomposition of older feldspathic rocks.

Rock Temple. Temples cut in rocks in w. India and in Missouri and Ohio in the U. S. See ELEPHANTA and ELLORA.

Rockweed. Common dark-green *Algæ* growing attached to rocks and other solid objects between tide marks, especially *Fucus vesiculosus*. Also known as Bladder Wrack, from its bladder-like floats.

Rocky Mountain Goat (HAPLOCERUS MONTANUS). Species of antelope found in the mountains of Colorado and Idaho and British Columbia. It has short legs, long, white, woolly hair, horns curved backward, and a short beard. Its flesh is of no value. This and the PRONG BUCK (q.v.) are the only species of antelope found in the New World.

Rocky Mountains. System on the e. border of the summit of the Cordilleran plateau of N. America. It extends from the s. U. S. n. with a w. trend into Canada, as far at least as Peace River. It forms the e. member of what may be called the Cordilleras of N. America. It is composed of numerous individual ranges, arranged for the most part *en echelon*, as they have a more westerly trend than the system itself. It traverses New Mexico, Colorado, Wyoming, Montana, Idaho, and Canada. The plateau upon which it stands has its greatest elevation in Colorado, where at the e. base of the mountains it has an elevation of 6,000 ft. Thence it diminishes s. and n., and at Peace River is not higher than 2,000 ft. The mountain ranges conform roughly to this, being in Colorado 13,000 to 15,000 ft. high, in Montana 10,000 to 11,000 ft., and in Canada gradually diminishing.

Rocky Mountain Sheep (OVIS MONTANA). Grayish-brown sheep inhabiting the higher mountains of the w. U. S. It is also called Bighorn, from the immense size of its horns, which curve backward. It stands ab. 3½ ft. high and is stoutly built. Its flesh is excellent mutton.

Rococo. Over-elaborate style of decoration, prevalent in France and elsewhere ab. 1600–1800. Scroll and shell orna-

Rococo Ornament.

ments abound; sometimes birds and fishes are combined with enormous flowers, and all meaning is sacrificed to a profuse effect.

Rocroi. Village of n.e. France, 24 m. n.w. of Sedan. Here Condé routed a Spanish army May 19, 1643. Pop. ab. 1,800.

Rodbertus, JOHANN KARL, 1805–1875. German statesman, economist, and Socialist, in the Prussian state service 1827–36; prominent in the events of 1848; in retirement through most of his life. His works have laid the foundation of modern scientific socialism.

Rode, JACQUES PIERRE JOSEPH, 1774–1830. French violinist, pupil of Viotti, first prof. of violin playing at Paris Conservatory 1794; solo violinist to Alexander I. of Russia 1803–8. Beethoven finished his sonata for pianoforte and violin Op. 96. A set of variations composed by him achieved great celebrity, and is still heard at times in a transcription for voice.

Rodentia (GLIRES). Order of placental, deciduate Mammals, which with the *Bunotheria* are known as *Pro-Ungulata*. They are characterized by having two large chisel-like and curved mesial incisors, growing from permanent pulps. Canines are absent, and a wide diastema exists in front of the flat-crowned molars. The latter have transverse ridges. The movement of the mandible is longitudinal or in the axis of the skull. To effect this the lower jaw is short and the glenoid cavity is laterally compressed. The feet are usually five-toed and unguiculate. The uterus is completely divided. The placenta is deciduate and discoidal. Rodents are small, active, and prolific animals, having several litters each year. The brain is smooth. They are widely distributed, but naturally absent from the Pacific Islands. In cold regions they usually hibernate. The food is principally vegetable (roots, nuts, or seeds). The chisel shape of the incisors is due to the wearing away of the softer posterior part of the teeth, the front face being strongly enameled. Most have but two incisors in each jaw, and they constitute the section *Simplicidentata*, arranged into three groups: *Sciuromorpha*, *Myomorpha*, and *Hystricomorpha*. The families *Leporidæ* (Rabbits) and *Lagomydæ* have a small second pair of incisors behind the first, and constitute the section *Duplicidentata*.

Roderick, d. 711. "Last of the Goths," King of the Visigoths in Spain 709; killed in the battle of Xeres de la Frontera, by which the Saracens routed a great Gothic army and gained possession of most of Spain.

Rodgers, JOHN, U.S.N., 1771–1838. Captain 1799; distinguished in the war with Tripoli and that of 1812.—His son, JOHN, U.S.N., 1812–1882. Captain 1862, Commodore 1863, Rear-admiral 1869, was active in the Civil War.—His cousin, CHRISTOPHER RAYMOND PERRY, U.S.N., 1819–1892, Commander 1861, Rear-admiral 1874, won distinction on the Atlantic coast. —His brother, GEORGE WASHINGTON, U.S.N., 1822–1863, Commander 1862, was killed at Fort Wagner.

Rödiger, EMIL, 1801–1874. Prof. Halle 1835, Berlin 1860; Orientalist. *Chrestomathia Syriaca*. 1838.

Rodin, AUGUSTE, b. 1840. French sculptor.

Rodman, ISAAC PEACE, 1822–1862. Brig.-gen. U. S. Vols. 1862; killed at Antietam.

Rodman, THOMAS JEFFERSON, U.S.A., 1815–1871. Inventor of hollow casting for cannons.

Rodman Gun. Captain Rodman, U. S. Ordnance De-

partment, devised a method by which heavy guns could be cast hollow and cooled from the interior by a stream of water circulating in the hollow core. By his method the unequal and uncertain strains arising in solid castings by unequal cooling from the exterior were held to be obviated. His system was adopted by the Government about the time of the rebellion, and he succeeded in constructing columbiads of 15 and 20 in. caliber, guns greatly exceeding in power and dimensions the solid cast-iron guns previously constructed.

Rodney, CÆSAR, 1728–1784. Delegate to Congress from Del. 1775–76; signer of the Declaration of Independence; Brig.-gen. 1775–77; Pres. of Del. 1778–82.—His nephew, CÆSAR AUGUSTUS, 1772–1824, was M.C. 1803–7 and 1821–22, U. S. Atty.-gen. 1807–11, U. S. Senator 1822–23, and Minister to La Plata 1823.

Rodney, GEORGE BRYDGES, R.N., BARON, 1718–1792. Rear-admiral 1759, Baronet 1764, Baron 1782; victorious over a Spanish fleet near Cape St. Vincent Jan. 16, 1780, and a French one off Dominica April 12, 1782.

Rodriguez. Volcanic island in Indian Ocean, 370 m. e.n.e. of Mauritius; discovered 1645: held by Britain since 1814. Pop., 1893, 2,068.

Roe, EDWARD PAYSON, 1838–1888. American novelist and horticulturist. *Barriers Burned Away*, 1872; *My Garden*, 1873; *A Chestnut Burr*, 1874; *A Face Illumined*, 1878; *Small Fruits*, 1880; *Nature's Serial Story*, 1884; *Miss Lou*, 1888. His books had a large sale.

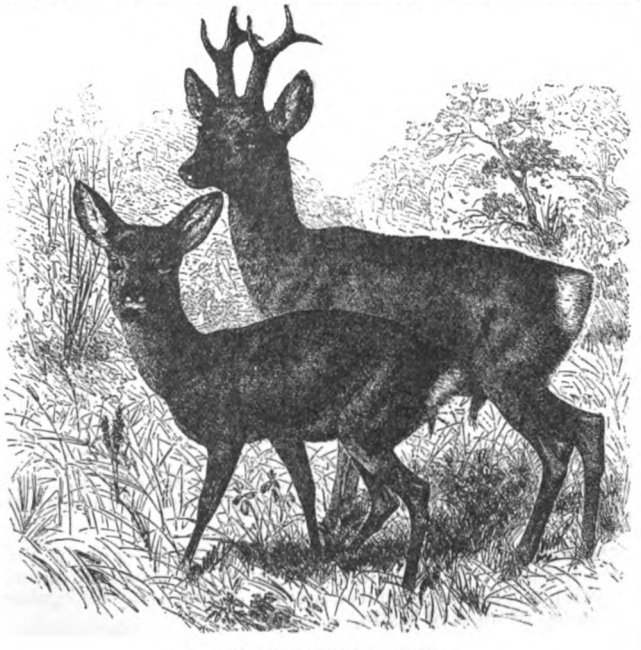
Roe, RICHARD. See DOE, JOHN.

Roe, SIR THOMAS, ab.1568–1644. English ambassador to India 1615–18, Turkey 1621–28, and other countries.

Roebling, JOHN AUGUSTUS, 1806–1869. Civil engineer, first to adapt suspension bridges to railroad traffic; builder of the Niagara and Brooklyn bridges. The latter was completed by his son, WASHINGTON AUGUSTUS, b. 1837.

Roebuck, JOHN ARTHUR, 1802–1879. M.P. 1832; prominent as a Radical. *Colonies*, 1849.

Roe Deer (CAPREOLUS CAPRÆA). European reddish brown deer, 2½ ft. high, with erect three-tined antlers in the male;



Roe Deer (*Capreolus capræa*).

rare, except in parks. They love high, forest-clad regions, and range east into Syria. The rutting season is midsummer.

Roemer, JOHANN JACOB, 1763–1819. Prof. Zürich. *Magazin für die Botanik*, 1785–90; *Archiv für die Botanik*, 1796–1805; *Flora europæa inchoata*, 1797–1811; *Caroli a Linné Equitis Systema vegetabilium*, 1817–30.

Roentgen Rays. Probable form of radiation discovered Dec. 1895 by Wilhelm Conrad Roentgen, b. 1856, prof. Giessen 1879 and Würzburg 1888. The name suggested by him and adopted by the world was "x-rays," indicating the unknown. The rays are best produced by the impact of the cathode rays within a Crookes tube upon a platinum disk placed in the focus of a concave aluminium projector used as the cathode of the tube. It is supposed that at the surface of the platinum the energy transformation takes place from cathode ray energy to x-ray energy. The real nature of the x-rays is not yet known, the best authorities wavering between a radiation theory and a material one. They are transmitted through various media with varying degrees of facility and affect silver salts. They are applicable to medical and surgical diagnosis; and silver negatives of bones, bullets, etc., which do not transmit the rays readily, in the soft tissues of the bodies, may be produced. This is called a Skotograph or Skiagraph. By interposing the substance to be examined between the Crookes' tube and a tube with a diaphragm covered with calcium tungstate, called a fluorescope, the effect is heightened, and the bullets, etc., may be readily observed.

Roepper, WILLIAM THEODORE, 1810–1880. Prof. Lehigh Univ. 1865–69; well known among mineralogists for his studies of crystalline forms.

Roepperite. 1. Mineral of the chrysolite group, containing iron, manganese, and zinc, found at Sterling Hill and Franklin Furnace, N. J. 2. Mineral carbonate containing large amounts of calcium and manganese with small quantities of magnesium and iron.

Roestone. See OÖLITE.

Rogation Days. Monday, Tuesday, and Wednesday, preceding Ascension Day: observed since ab. 450 as litany days.

Roger I., 1031–1101. Brother of Robert Guiscard, and his successor 1085 in Naples; conqueror 1060–90, and Count of Sicily.—His son, ROGER II., 1097–1154, was crowned King of Sicily 1130, conquered the n. coast of Africa, and was a wise and powerful monarch.

Roger OF WENDOVER, d. 1237. English monk, author of a Latin chronicle 1189–1235, tr. 1849, and continued by Matthew Paris.

Rogers, FAIRMAN, b. 1833. Prof. Univ. Pa. 1858–70; civil engineer. *Magnetism*, 1883.

Rogers, HENRY, 1806–1877. Prof. Univ. Coll., London, 1839; pres. Lancashire Coll. 1858. *Essays*, 1850–55. His *Eclipse of Faith*, 1852, and its *Defense*, 1854, answered F. W. Newman's *Phases of Faith*, 1850–53.

Rogers, HENRY DARWIN, LL.D., 1808–1866. Prof. of Geology Univ. Pa. 1835–46; prof. Glasgow 1858. He made a geological survey of N. J., and pub. a report and map 1835, and a final report 1840; 1836–55 he was engaged in making a survey of Pa., giving especial attention to structural and dynamic geology.

Rogers, HENRY J., 1811–1879. Inventor of the system of signals adopted by U. S. Navy 1846, modified 1861.

Rogers, HENRY WADE, LL.D., b. 1853. Law Prof. Univ. Mich. 1883; pres. Northwestern Univ. 1890. *Illinois Citations*, 1880; *Expert Testimony*, 1883.

Rogers, JAMES EDWIN THOROLD, 1823–1890. Prof. Political Economy at Oxford 1862–68 and 1888; M.P. 1880–86. *Hist. Agriculture and Prices*, 6 vols., 1866–88; *Economic Interpretation of History*, 1888; *Industry and Commerce*, 1892.

Rogers, JOHN, ab.1505–1555. Chaplain at Antwerp 1534; tr. Bible 1537; canon of St. Paul's, London, ab.1549; burned at Smithfield, first of the martyrs under Mary.

Rogers, JOHN, b. 1829. American sculptor, many of whose statuette groups have been largely reproduced in composition.

Rogers, RANDOLPH, 1825–1892. American sculptor, in Italy from 1855.

Rogers. RICHARD, ab.1550–1618. English Puritan. *Seven Treatises*, 1605.

Rogers, ROBERT, 1727–1800. Soldier of N. H., prominent in the French war, and as a Tory 1776; author of several books.

Rogers, ROBERT WILLIAM, D.D., b. 1864. Prof. Haverford 1887, Dickinson 1890, and Drew Theol. Sem. 1893; Orientalist.

Rogers, SAMUEL, 1763–1855. English banker and poet. *Pleasures of Memory*, 1792; *Italy*, 1822; *Table-talk*, 1856.

Rogers, WILLIAM AUGUSTUS, F.R.S., b. 1832. Prof. Harvard 1877, and Colby Univ. 1886; astronomer.

Rogers, WILLIAM BARTON, LL.D., 1804–1882. Brother of Henry D.; Prof. of Natural Philosophy and Geology in Univ. Va. 1835–53; Pres. Mass. Inst. Tech. 1862–68. He examined the region of mineral springs of Va., and organized a State Geological Survey 1835–42.—Of his brothers, JAMES BLYTHE, 1802–1852, was Prof. of Chemistry at Univ. Pa. 1847, and ROBERT EMPIC, 1813–1884, at Univ. Va. 1842–52, Univ. Pa. 1852–77, and Jefferson Medical Coll. 1877.

Roget, PETER MARK, F.R.S., 1779–1869. London physician, prof. Royal Institution 1833. *Physiology*, 1834; *Thesaurus of English Words and Phrases*, 1852.

Rogue Money. Assessment formerly levied in Scotland, for defraying the expenses of apprehending criminals.

Rogue River Indians. Tribe of Indians living in Oregon and belonging to the ATHAPASCAN (q.v.) family.

Rogue's March. When a soldier was sentenced to be drummed out of the service he was escorted by a file of soldiers

in front of the command while the drum and fife played a derisive tune, called the rogue's march: this sentence has of late years been entirely abrogated in the U. S. Service.

Rohan, HENRI, DUC DE, 1579–1638. French soldier, leader in Huguenot revolts. *Mémoires*, pub. 1644–1758.

Rohan, LOUIS RENÉ EDOUARD, PRINCE DE, 1735–1803. Cardinal 1778; Bp. of Strassburg 1779. See DIAMOND NECKLACE.

Rohillas. Afghan Pathans who rose in power in Rohilcund, India, ab.1750. They were subdued in 1773.

Rohlfs, MRS. ANNA KATHERINE (GREEN), b. 1846, m. 1884. American writer of detective stories. *The Leavenworth Case*, 1878; *X Y Z*, 1883; *Mill Mystery*, 1886; *Behind Closed Doors*, 1888; *Marked Personal*, 1893.

Rohlfs, GERHARD, 1832–1896. German explorer in Africa; author of many books of travel. *Morocco*, 1868, tr. 1874; *Abyssinia*, 1869, tr. 1883.

Rojas, JUAN RAMON, 1784–1824. Poet of the Argentine revolution. *Poesias patrias*, 1820.

Rojas y Zorilla, FRANCISCO DE, 1607–ab.1680. Spanish dramatist.

Rokitansky, KARL, BARON VON, 1804–1878. Prof. Vienna 1834–75. His *Handbook of Pathological Anatomy*, 5 vols., 1842–46, tr. 1849–52, is of great importance.

Roland. Hero of legend and poetry; warden of Brittany under Charlemagne; killed 778 at Roncesvalles in Spanish Navarre.

Roland de la Platière, JEAN MARIE, 1734–1793. French official, author of a *Dictionary of Manufactures*, 1785.—His wife, MANON JEANNE PHLIPON, 1754–1793, a Girondist leader, was guillotined, leaving *Memoirs*, pub. 1864, and *Letters*, 1867.

Rolander, DANIEL, 1720–1774. Swedish naturalist, who studied and described the flora of Guiana.

Rolfe, WILLIAM JAMES, b. 1827. American editor (1870–83) and critic of Shakespeare. *Shakespeare the Boy*, 1896.

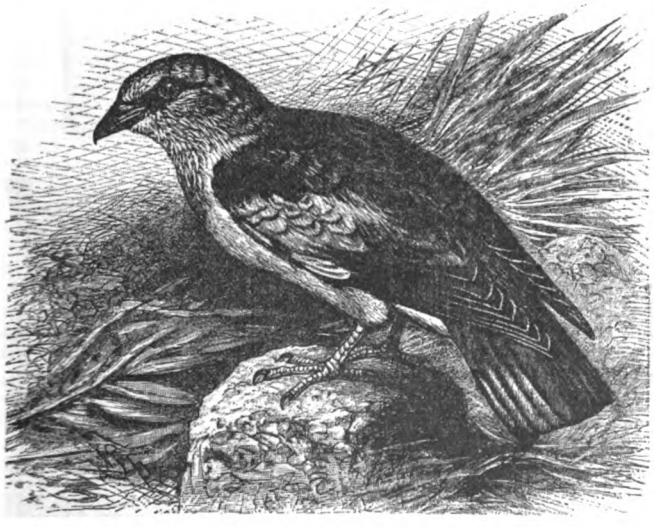
Roll, ALFRED PHILIPPE, b. 1847. French painter.

Rolled Sections OF IRON. The usual sections of structural iron are the I-BEAM (q.v.), channel-iron, angle-iron (of equal and unequal legs), tee-iron, deck-beam (or bulb-iron), and rail rolled from iron or steel billets. The usual merchant sections are the flat, square, round, hexagon, and octagon. The usual strength per sq. in. of these sections is from 50,000 to 55,000 lbs.

Roller-Ball. Sport aiming at the propulsion of a large ball between two goals. Attempts have been made to develop this in many ingenious ways, but no great advance has been made.

Roller Mill. Form of flouring machine in which the grain is crushed by passing between two rolls either smooth or toothed and revolving in the same or opposite direction at different velocities. The rolls are made of hardened steel or porcelain. See FLOUR.

Rollers. Picarian Old World birds of bright colors, common in the Ethiopic-Indian region. They, like the Tumbler



Roller (*Coracias garrula*).

pigeon, have the habit of turning somersaults during flight. The common Roller of Europe (*Coracias garrula*) is blue-green, with cinnamon color on the wings. *Eurystomus* of India and Australia includes the Broad-billed Rollers.

Rolleston, GEORGE, F.R.S., 1829–1881. Prof. Oxford 1860. *Forms of Animal Life*, 1870.

Rollin, CHARLES, 1661–1741. French historian, prof. Paris 1688, and Beauvais 1699–1711 and 1720. His *Ancient History*, 13 vols., 1730–38, was widely used. *Traité des Etudes*, 4 vols., 1726–31; *Roman History*, 16 vols., 1738–48.

Rolling Mill. See ROLL TRAIN.

Rollin Ledru. See LEDRU-ROLLIN.

Rollins, EDWARD HENRY, 1824–1889. M.C. from N. H. 1861–67; U. S. Senator 1877–83.

Rollo, or ROLF, ab.850–930. Chief of the Northmen, who headed piratical expeditions against Scotland, England, and Flanders, and in 912 established himself on the Seine, acknowledged Charles III. as his overlord, and founded the duchy of Normandy.

Rolls, or CORNISH ROLLS. Machine used in mining districts, in which rock or ore is reduced in size by passing between revolving cylinders, either smooth or corrugated, lying side by side, the fine material produced dropping between the cylinders into proper receptacles below.

Roll Sulphur. See SULPHUR.

Roll-Train. Machine by which spongy and porous masses of weld-metal are compacted and welded, and market shapes produced from rectangular billets, blooms, or ingots by pressure. A roll consists of a body smooth and cylindrical for plate metal, but with grooves and fillets of various profile for shapes. At the ends of the body are the two necks, which are the journals on which the roll turns, and beyond the necks are the pods by which rolls are coupled by junction-rods and boxes. These junction-rods permit vertical adjustment of one set of rolls without distress to the next set, and the junction-boxes are calculated so as to break under undue strain, before accident to the rolls. The rolls are carried in a housing at each end, and are two-high or three-high. Where but two rolls are used, the rolling engine must be reversed, or the work passed back over the top roll, so as always to be entered from the same side. The three-high train involves the use of a table for heavy work, where rolls are large for stiffness. The opening part in one roll and part in the other is called a pass. Passes are classified according to function, as welding, shaping, drawing, edging, flatting, and polishing passes; according to shape, as flat, box, gothic, square, round, polygonal and shape passes; according to construction, as open or closed, eccentric, spiral and intermittent. The first set of rolls for operating on hottest and roughest work is called the roughing or breaking down rolls, and in England the cogging rolls. For perfecting the profiles, the train is called the finishing train. For adjusting the spaces between rolls, the brasses under the necks of the rolls are adjusted by screws in the housings. The middle roll of three may be screwed up and down, or the upper and lower roll may move together toward the middle roll. The weight of the roll or rolls is largely borne by counterweights below the floor level. Reversing trains are driven by a double engine without fly-wheel and with cranks at 90°, the valve-gear link-motion being operated by a hydraulic cylinder. Similarly the feeding tables of three-high trains are raised and lowered by hydraulic power, and the feeding rolls in them are driven by a smaller engine with link-motion. Turning of the piece is done by sets of fingers coming up between the rolls as the table is lowered. The largest roll-trains in this country are those of Carnegie, Phipps & Co., which are 32 in. by 115 in. long. Krupp's large rolls, at Essen, Prussia, are 34 in. diam. by 120 in. long.

Romagna. N. part of Papal States till 1861; now provinces of Bologna, Ravenna, Ferrara, and Forli.

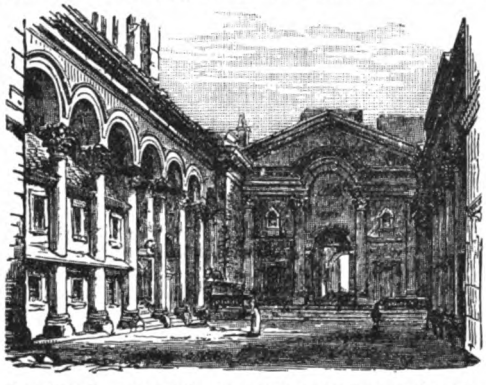
Romagnosi, GIAN DOMENICO, 1761–1835. Law prof. at Parma 1802, and Milan 1807; legal and philosophical writer. *Works*, 19 vols., 1832–35.

Romaic. Modern Greek, descendant of classical Hellenic speech.

Romaine, WILLIAM, 1714–1795. London divine, prominent in the Evangelical party. His *Life*, *Walk*, and *Triumph of Faith*, 1763–71–94, were long popular. *Works*, 8 vols., 1796.

Roman and Romanesque Architecture. Roman building employed the arch, but the decorative elements of Roman architecture were those of the Grecian construction, of which the structural elements were the post and lintel. The Roman temples were imitations of those of Greece and the Greek colonies, and resembled them in all essentials, although they substituted for the simplicity and lucidity of the Grecian examples a method of decoration at once more ornate and less refined. The Doric and Ionic orders were thus only mixed in their Roman use. Only in the Corinthian order can it be

maintained that the Roman examples will bear a comparison with those of Greece. In other works than temples the Romans undertook to combine the Greek architecture with an arched construction. This was done both on exteriors and in interiors, and in both cases with awkwardness and want of success. On the exterior they employed a system of columns and entablatures to decorate a wall pierced with arched openings. Sometimes, as in the temple at Baalbec, the order extended through several stories or stages, and sometimes, as in the Colosseum at Rome, it was repeated with or without variations at every stage. In the interiors, the entablature was retained and the arches opening from it. In the case of a detached column a fragment of entablature was interposed under the springing of the arch or vault. The omission of this undermost fragment, and the imposition of the arch directly upon the column, was the beginning of ROMANESQUE ARCHITECTURE, the architecture of the column and round arch. This was derived from classical Roman architecture, and obtained in w. Europe after the fall of the Roman Empire. The earliest building to which this innovation has been traced is the palace of Diocletian at



Courtyard of Diocletian's Palace at Spalato, Dalmatia.

Spalato, which is accordingly regarded as the beginning of Romanesque architecture. From Italy the Romanesque spread until it prevailed in Spain, France, Germany, and England. The local variations were numerous and so important that many of them are treated as separate styles, under the names of Italian, Provençal, Rhenish, and Norman. But all the variations had in common the use of the Roman features of construction, the column and the round arch, with a divergency from the forms of classical Roman, increasing with the distance, in space and time, from the Roman examples. For nearly a thousand years the influence of Roman architecture is more or less distinctly perceptible in all the ambitious and important buildings of w. Europe. The modifications in it produced in the 13th century, beginning in France, by the development of groined vaulting, were so great as to deserve and obtain the name of a new style, the Gothic; but this was nevertheless the product as well as the successor of Romanesque, and the transition from the style of the round arch to that of the pointed arch affords one of the most interesting chapters in the history of architecture. See ARCHITECTURE.

Roman Archæology. See ARCHITECTURE, SCULPTURE, PAINTING, THERMÆ, TRIUMPHAL ARCH, CARACALLA, FORUM, AMPHITHEATER, COLOSSEUM, PANTHEON, etc.; also BATHS, ROMAN.

Roman Aqueducts. See AQUEDUCT.

Roman Baths. See BATHS, ROMAN.

Roman Catholic Church. Aggregate of those churches, forming about half of Christendom, which, under their bishops, acknowledge the Pope as having by divine right, as defined 1870, "ordinary and immediate" episcopal authority. Most of these follow the Latin rite. The number of Roman Catholics in the world in 1892 was estimated to be as follows: Europe, 160,165,000; America, 58,393,882; Oceanica, 6,574,481; Africa, 2,655,920; Asia, 3,007,250; total, 230,866,533. Total number of Christians in the world was estimated to be 477,080,158. In U. S. 1895 there were 7,474,850 members of R. C. Ch. out of a total of 23,231,490 members of all denominations.

Romance Languages. Made up of Italian, French, Provençal, Spanish, Portuguese, Rhæto-Romanic, Wallachian or Roumanian, and other dialects, all descended from the lingua rustica or vulgar tongue of the Romans. Rhæto-Romanic and Roumanian play but a small part, and have few monuments. French, with its enormous literature and linguistic influences, is reckoned from the Strassburg Oaths 842. Italian begins ab.1200. Spanish and Portuguese begin as independent and literary tongues ab. 1200. The Romance Languages are receiving increased attention at universities everywhere, and form a prominent part of philological investigation.

Roman Cement. Hydraulic cement made from volcanic rock by the Romans. See PUZZOLANA.

Romances of Arthur. Originating with Nennius, a Breton monk of 9th century, these were enlarged by Geoffrey of Monmouth 1140, and completed by Sir T. Malory, whose *Morte d'Arthur*, 1470, was the source of Tennyson's *Idylls of the King*.

Romances of Chivalry. Third form of Spanish writings in order of development. They were the literature of the knightly classes, as the ballads were of the people. During the 16th century the passion for them was intense.

Roman Colonies. See COLONIES, ROMAN.

Roman de la Rose. Allegorical French poem begun ab.1237 by Guillaume de Lorris, and finished by Jean de Meung ab.1277, in a coarse and satirical vein; tr. by Chaucer.

Roman Empire. See HOLY ROMAN EMPIRE.

Romanes, GEORGE JOHN, LL.D., F.R.S., 1848–1894. B. in Canada; prof. Royal Institution, 1888–91, and at Oxford. *Theism*, 1878; *Animal Intelligence*, 1881; *Mental Evolution*, 1883–88; *Darwin*, 1896.

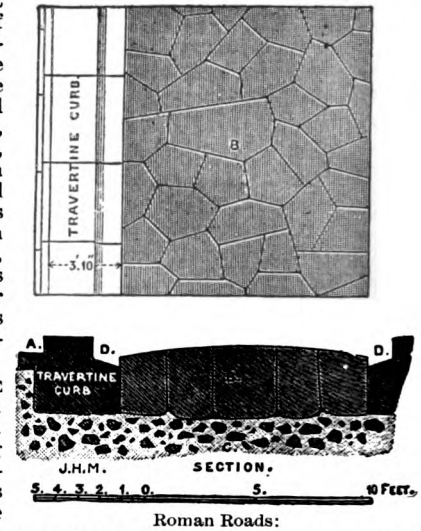
Roman Games. See CIRCUS, GLADIATORS, CÆSTUS, etc.

Roman Law. System of jurisprudence developed by the Roman Republic and Empire. Its earliest records are contained in the Twelve Tables, adopted ab.450 B.C.; its final reduction into systematic form occurred under Justinian ab.527–534, when the *Institutes*, *Digest*, and *Code* were published. This body of rules forms the basis of the modern law of every country in Europe except England; it has also affected the English common law both in Britain and the U. S.

Romano, GIULIO. See GIULIO ROMANO.

Romanoff, HOUSE OF. Descended from Andrew Kobyla, who came from Prussia to Moscow 1341. Fifth in descent from him was Roman Juricvitch, d. 1543, whose daughter married Ivan the Terrible, and whose son, Nikita Jurief, also allied himself by marriage with the royal house of Rurik. His grandson, Michael Romanoff, was chosen Czar 1612, after the false Dmitri. The succeeding names are: Alexei, 1648–76; Feodor, 1676–82; Peter the Great, 1682–1725. After the death of Catharine I., Peter II., 1727–30, last of the male line: Anna Ivanovna, daughter of Ivan, brother of Peter I., 1730–40; Ivan IV., 1740–41; Elizabeth, daughter of Peter I. and Catharine, 1741–61; Peter III., 1761–62, assassinated. After Catharine II., Paul I., 1796–1801; Alexander I., 1801–25; Nicholas I., 1825–55; Alexander II., 1855–81; Alexander III., 1881–94; Nicholas II., 1894.

Roman Roads. These were stone pavements from 3 to 16 ft. in width, built on a foundation of masonry laid in cement. Twenty-nine roads centered at the Forum in Rome, and the length of these, with their branches, was 52,964 Roman miles. They were laid out for long distances in straight lines with little regard to grade, were built by soldiers and slaves, and under present conditions would be uneconomical.



Roman Roads:
Example of early basalt road by the temple of Saturn on the Clivus Capitolinus. A. Travertine paving. B. Polygonal basalt blocks. C Concrete bedding. D. Rain-water gutter. The curb shown is taken from another part of the road.

Romans, EPISTLE TO THE. Sixth N. T. book, written by St. Paul ab.58, developing the doctrine of Salvation through Faith, as engendering a more perfect, because internally prompted, obedience.

Romans, KING OF THE. Title assumed by Henry II. prior to his coronation as emperor, and by his successors till Maximilian.

Romantic. In musical criticism, as in literary, the antithesis of classical; word of inexact meaning, often applied very arbitrarily. Its origin and significance are plain as applied to operas or other vocal compositions which tell stories of chivalry and knighthood, either drawn from romance liter-

atures or imitative of them, as the operas of Weber, Marschner, and Wagner. It can be used in instrumental music, in which the composer gives a clew to his aims by means of titles, superscriptions, or mottoes (see PROGRAMME MUSIC); in general it is independent of conventional restrictions in its strivings for expression, or has a preponderance of the subjective element, or its content outweighs form, whereas classical music has been developed to the highest pitch of perfection on its formal side in obedience to generally accepted laws, placing æsthetic beauty over emotional content, or refusing to sacrifice form to characteristic expression.

Romanticism. Literary movement opposed ab.1800 to classicism, and more recently to realism. It aimed at a wider range of topics and motives, and a freer admission of the imagination and emotions. In its earlier form it revolted against cold formality, in its later against superficiality and "the deadly commonplace." Though often extravagant, its work has been essential to breadth and health. Victor Hugo, one of its chief apostles, called it simply liberalism in literature.

Romany, or ROMMANY. Language spoken by GYPSIES (q.v.). Rom signifies a man in their dialect.

Roma Quadrata. Original settlement of Rome on the Palatine Hill, with some portion of the land adjacent, all surrounded by walls in quadrangular form.

Romberg, ANDREAS JAKOB, 1767–1821. German violinist and composer, who succeeded Spohr 1815 as Hofkapellmeister at Gotha. He wrote eight operas and many other works, now forgotten, except a setting of Schiller's *Die Glocke.*

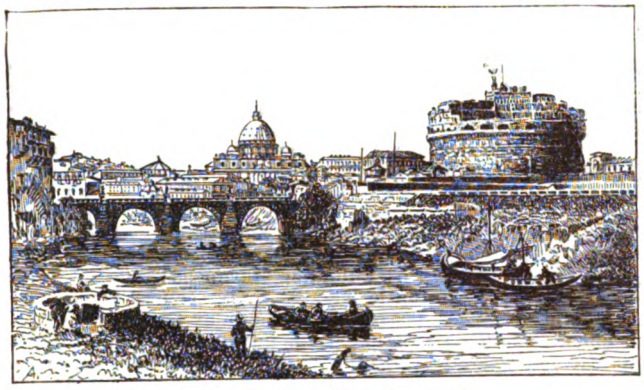
Romberg, BERNHARD, 1742–1814. German violoncello virtuoso and composer.

Rome. Capital of Italy, on the Tiber, 14 m. from its mouth. Its history is that of a municipality. Tradition alleges that the city was founded 753 B.C. by Romulus upon the Palatine Hill. The union of the Latins on the Palatine and the Sabines on the Quirinal Hill, tribes belonging to the two great races of Central Italy, Latin and Oscan, was prophetic of the Roman policy of incorporation, which was the source of her strength. Early R. was a non-hereditary monarchy till 510. There was also a council of elders, the Senate, and an assembly of the people, Comitia. After the expulsion of the kings this power fell to two magistrates, Consuls, elected annually. Very early two distinct classes appear in the city; Patricians, heads of families, who alone were citizens and eligible to the magistracies, and Plebeians, a class recruited from former clients, emancipated slaves, refugees, traders, etc. The Plebeians became numerous and prosperous, and were admitted to the citizen army, but not to citizenship. The internal history of the Republic for two centuries is the struggle of the Plebs for political equality. Their secession from the city 494 B.C. secured them the Tribuneship, an inviolable office and independent of the Senate, created for the protection of the Plebs; but politically it separated rather than united the two classes, and was liable to great abuse. The Plebs obtained political equality ab.300 B.C., with a separate assembly, Comitis Tribula, and the right of legislation. R. then became in name a democracy, but in fact it was administered by a narrow aristocracy. The conduct of foreign affairs required some such arrangement. But the aristocrats turned their power to private ends, and the attempt of the popular party to recover its power caused the overthrow of the Republic.

The expansion of R. steadily followed upon her numerous successful wars. The Etruscans were conquered 396 B.C., but the city was destroyed by the Gauls of n. Italy 390 B.C. A series of wars began ab.343 with the Samnites and Latins, who were jealous of R.'s growing power. It resulted in Roman supremacy over Central Italy. R. came next in contact with the Greeks of s. Italy, who appealed to Pyrrhus for aid 281. He was conquered and s. Italy subjugated. R. was now neighbor to Carthage, and rivalry was inevitable. The Punic wars began 264 B.C. Carthage was defeated and Sicily annexed 241 B.C.; this was the beginning of R.'s provincial system. The second Punic war, 218–202 B.C., was a desperate life-and-death struggle, noted for Hannibal's march over the Alps to Italy, where he repeatedly defeated the Romans. The fidelity of R.'s Italian allies and her own superb courage saved her; Carthage was subjugated. R.'s power had now become immensely augmented. She bound her allies to herself by a prudent system of colonization and local segregation and a network of military roads; but citizenship was charily granted.

R.'s alliance was now courted by rival factions in the East, and the Macedonian wars, 214–168 B.C., broke out, resulting in the subjection of Greece and the Macedonian provinces. R. was now inevitably launched upon her career of conquest. Her commercial rivals, Corinth and Carthage, were cruelly crushed. The subjugation of Spain, and later of Gaul, followed. R. had thus become the virtual mistress of the world. Her provinces lined the Mediterranean. Meanwhile the municipal constitution had remained unchanged. The aristocracy had become intrenched in power and enriched with the wealth of the subjugated. The problem of administration was yet to be solved. The strain upon the inadequate municipal constitution became insupportable. The incongruousness of a municipal empire was evident. Flagrant misgovernment resulted. The provinces were systematically pillaged. The enormous increase of slaves, with vicious economic legislation, pauperized free laborers. Small farms were replaced by latifundia. Millionaires and paupers confronted each other in sullen hate. The rabble of the city had swelled to a dangerous mob. Greed of wealth corrupted the aristocracy. A contest was inevitable. Tiberius Gracchus began it 133 B.C. by demanding a surrender of the public lands illegally occupied, and their redistribution among the poor. He was murdered by the aristocrats, as was his brother Caius, 123 B.C., who followed in his steps. The Jugurthine war, which followed, illustrated the venality of the administration. Marius, the victor, became the popular leader; he utterly failed as a statesman. The murder of Drusus for favoring the admission to citizenship of the Italian allies incited them to arms 90 B.C. The social war was ended by the grudging concession of citizenship. Thus the municipality was virtually destroyed. The opposition of Optimates and Populares continued, and resulted in the Civil war, 88–81 B.C., with Sulla and Marius as leaders. Sulla's success in the Mithradatic war, 85 B.C., secured to him the army, and he easily destroyed the popular forces, proscribed his enemies, and reconstructed the government upon an aristocratic basis, subjecting the troublesome tribunate to the senate. The antagonism was, however, only aggravated. The popular party only awaited a leader. Insurrections of slaves and gladiators, the formidable conspiracy of Cataline, revolts of provinces, revealed the incapacity of the aristocracy. This confusion furnished the opportunity of ambitious men. Pompey, a successful general, Crassus, a wealthy politician, and Cæsar formed a triumvirate to divide among themselves the power and profits of the incapable aristocracy. The death of Crassus was followed by a rupture between Cæsar and Pompey, whereupon civil war ensued. Cæsar, with a disciplined and devoted army, seized R., conquered Pompey at Pharsalia, 48 B.C., and established the military monarchy with great skill and moderation. His assassination by Brutus and others, March 15, 44 B.C., was a grave calamity to the state. Civil war again broke out, and resulted (30 B.C.) in the ultimate supremacy of Octavianus, nephew of Cæsar, by whose judicious management the foundations of the empire were securely laid. The Augustan age was R.'s most illustrious period. There was, however, no formal revolution. The fiction of a lifelong magistracy was successfully maintained until Diocletian, 284, threw off disguise and revealed a monarchy supported by soldiers. The commonwealth had gradually ceased to exist. The inhabitants of the provinces had been admitted to Roman citizenship, and all merged in the empire. The succession was maintained for a while in the family of Augustus and affiliated branches. Peace and wise administration secured the prosperity of the empire. But from the time of Marcus Aurelius, 161–180, dates the period of decline. Emperors were declared and dethroned by the army, or the throne was sold to the highest bidder. Rival emperors contended, provinces revolted, and the barbarians were pouring in on all sides. Diocletian divided the empire into four parts. R. was deserted by the emperors; Constantine transferred the seat of government to Constantinople 330, and fixed the absolutism of imperial authority. Accelerated decline followed. Julian fell before the Persians, and Valens was destroyed by an irruption of the Visigoths 378. Theodosius conquered his rivals and was acknowledged ruler of the whole empire 394. Under his imbecile successors it was again divided. The barbarians were subsidized, and then turned against their incapable rulers. R. was sacked by Alaric 410, by the Vandals 451. The emperors became the tools of their generals, and Romulus Augustulus was deposed 476. The Eastern empire at Constantinople continued till overthrown by the Turks 1453. The Western empire was revived by Charlemagne 800, and continued in the German line until terminated by Napoleon 1806. Meantime R. gained new importance as the seat of the popes, and suffered heavily in the wars between Guelphs and Ghibellines, being repeatedly taken, sacked, and burned. It was held by the French 1797–1814, and was a nominal republic 1799 and 1848. Since 1871 it has been the capital of Italy. It is celebrated for its architectural works, chief among which are the cathedral of St. Peter and the palace of the Vatican, and its treasures of art. R. is situated on an undulating plain (85 by 25 m.) of marine and alluvial deposits, intersected by volcanic masses. It lies chiefly on the left bank of the Tiber, on the plain; on the same side are the Seven Hills of R., the Capitoline, Palatine, Aventine, Cœlian, Esquiline, Viminal, and Quirinal, and upon these

was the ancient city; in the Middle Ages these were uninhabited. On the right bank is the smaller portion of the city, connected with the greater by several bridges. The Tiber flows through the city in an artificial channel, constructed in 1876. The average width of the river is 195 ft. and its depth 20 ft., sometimes rising 35 ft. more. The first walls of R. were about the Palatine hill, 48 ft. high, with 3 gates; under Servius Tullius they were 7 m. long, across the valleys only, with 37 gates; under Aurelian, they were 11 m. long, with 14 gates and 8 bridges across the Tiber; under Vespasian, they were 13 m. long, with 13 gates; they were built of tufa concrete, faced with brick, 55 ft. high. The walls now are 10 m. on the left bank and 4 m. on the right. The area within the walls is 3,880



The Bridge and Castle of St. Angelo.

acres. Since 1870 R. has been fortified by 30 forts in a 30 m. circle. Its manufactures are of little importance, mostly in jewelry, silk and the fine arts. The university, founded 1303, had 81 instructors and 1,543 students in 1891. The public libraries have ab. 1,000,000 books and manuscripts. Under Augustus the population was 1,300,000, one-half slaves; under Vespasian it was 2,000,000; in 1894, it was 463,790. See AQUEDUCT.

Rome. City of Oneida co., N. Y., on the Mohawk; chartered 1819 and 1870: site of Fort Stanwix, besieged by the British 1777. Gen. Herkimer, going to its relief, was ambuscaded at Oriskany, 6 m. s.e. Pop., 1890, 14,991.

Rome, PRIX DE. Prize given by the Conservatory and the School of Fine Arts in Paris. The recipient is expected to study painting at Rome and to lodge in the Villa Medici. It continues for four years. The second prize is a gold medal.

Rome, RELIGION OF ANCIENT. This was the outgrowth of the mythological and legendary beliefs of the various peoples who migrated to Italy. The predominant features were those of the Etruscans, Sabines, and Latins, later influenced by the Greeks, and the gods were derived from these sources. The Romans regarded the highest duty to be submission to authority, they worshiped an abstraction. Every event, act, thing, and person had a tutelary deity, and the promises to the gods were carried out to the letter. They had prayers, vows, offerings, sacrifices, libations, songs, dances, and games. Their sacred places were hallowed spots on hills or in groves; or special temples were provided with altars for libations and burnt offerings. A priesthood grew up, which gradually acquired privileges; the Augurs, Vestal Virgins, Pontifices, Sibyls, Fetiales, and Salii. The gods were grouped in sets as Jupiter, Juno, Minerva, the Capitoline deities of power, womanliness, and wisdom; Sol, Luna, Tellus, the stars; Orcus, Dives, Libitina, the infernal regions; Vulcan, Fire, and Vesta, the domestic hearth; Saturnus and Ops, agriculture; Pales, flocks: Faunus and Fauna, oracles; Parcæ, fates; Fortuna, luck; Lares, life, Manes, death, Penates, after death, the household gods; Mars, war, comes next to Jupiter. The Romans addressed their prayers directly to the god, without any mediator. This religion held firm hold of the people until the Roman simple and industrious life degenerated into luxurious ease, when it was replaced by unbelief, sectarianism, and mysticism, under mercenary and ignorant priests. Constantine the Great established Christianity as the state religion, and abolished the last trace of the Roman religion.

Römer, OLE, 1644–1710. Prof. of Mathematics and Astronomy at Copenhagen 1681; inventor of the transit instrument, and discoverer of the fact that light occupies an appreciable time in its passage through space.

Romero, MATIAS, b. 1837. Mexican minister at Washington 1863–68, 1882, and since 1884; Sec. Treasury 1868–73 and 1876–79.

Rome-Scot. See PETER'S PENCE.

Romilly, SIR SAMUEL, 1757–1818. London lawyer, knighted 1806; M.P. and Solicitor-gen. 1806; active and able reformer, especially of the criminal law, wherein his success was posthumous. *Speeches*, 1820; *Autobiography*, 1840.—His son, JOHN, 1802–1874, was M.P. 1832–35 and 1846–52, Solicitor-gen. 1848, Attorney-gen. 1850, Master of the Rolls 1851–72, and Baron 1866.

Romney, GEORGE, 1734–1802. English portrait painter, ranking next to Reynolds and Gainsborough.

Romsdal. Mountain valley of s.w. Norway, noted for its wild scenery. It comprises the R. Fiord, an inlet of the sea,

Veblungsnaes.

60 m. in length and on an arm of which are the villages R. and Veblungsnaes. Area 6,030 sq. m., pop. 117,200.

Romulus. Mythical founder of Rome. He and Remus, sons of the Vestal Rhea Silvia by Mars, were suckled by a wolf and reared by a shepherd. Disagreeing as to the site of their city, Remus was slain by R., who reigned 37 years, and was taken to heaven in a fiery chariot and worshiped under the name of Quirinus.

Romulus Augustulus. Last emperor of Rome 475–476; deposed by Odoacer.

Roncesvalles. In the Pyrenees: place where Roland, Charlemagne's paladin, is said to have been defeated and slain by the Basques 778. The French under Soult were defeated here July 25, 1813.

Rondeau. Short poem involving a refrain or repetition; popular in 17th century, and recently revived in English verse.

Rondeau, JOSÉ, 1773–1834. Argentine director or dictator 1815 and 1819–20; Pres. 1828–29.

Rondo. Musical form, frequently used for the last movement of sonatas, concertos and symphonies, copied after the French verse form, rondeau. In it the principal theme is repeated several times, like the literary refrain, the repetitions being separated by new themes called episodes.

Ronge, JOHANNES, 1813–1887. German-Catholic leader, excommunicated 1844, in exile 1849–61.

Ronins. Japanese swordsmen, subjects of a famous romance.

Ronsard, PIERRE DE, 1524–1585. French poet, founder of the classical school; extremely popular in his day. *Odes*, 1550–52; *Amours*, 1552–56; *Hymns*, 1555. *Works*, 1560–84.

Rood. See HOLY ROOD.

Rood. In Gothic Architecture, a crucifix, especially when placed upon a screen in front of the chancel.

Rood, OGDEN NICHOLAS, LL.D., b. 1831. Prof. of Physics at Columbia 1863; microscopist and inventor. *Modern Chromatics*, 1881.

Rood-Loft, or ROOD-SCREEN. Partition, sometimes of masonry, but more commonly of wood, between the nave or part appropriated to the congregation and choir, or place reserved for the clergy, in a church or cathedral. They were often of great elaboration and elegance. One of the most famous, a work of the French Renaissance, is in the church of St. Etiènne du Mont in Paris.

Rood Tower. Name sometimes given to a tower erected

ROMAN EMPIRE
IN ITS GREATEST EXTENT.
Roman Miles
British Miles
Geographical Miles
ORCADES
HIBERNIA
BRITANNIA
OCEANUS BRITANNICUS
OCEANUS GALLICUS
OCEANUS CANTABRICUS
GALLIA
AQUITANIA
LUGDUNENSIS
GERMANIA
HISPANIA
TARRACONENSIS
LUSITANIA
BÆTICA
MAURITANIA
MARIANUS M.
ATLAS M.
MEDITERRANEUS
BALEARES IÆ.
NUMIDIA
SARMATIA ASIATICA
SARMATIA EUROPÆA
MAEOTIS PALUS
CASPIUM
CAUCASUS M.
ALBANIA
COLCHIS
IBERIA
PONTUS EUXINUS
PAPHLAGONIA
CAPPADOCIA
ARMENIA
MESOPOTAMIA
ASSYRIA
CILICIA
SYRIA
SYRIÆ DESERTA
ARABIA PETRÆA
ARABIA
ARABICUS SINUS
CYPRUS
TROPIC OF CANCER

at the crossing or intersection of the nave and transepts of a Gothic church.

Roof. In Mining, rock overlying a seam of coal or any nearly horizontal ore deposit; corresponding to the hanging-wall of veins or the more highly inclined deposits.

Roofs. The largest roof ever constructed was that over the Manufactures and Liberal Arts building at the World's Columbian Exposition of 1893 in Chicago. Its total width was 787 ft., supported by three trusses, and its length 1,687 ft., the total area being 30½ acres. The central court was covered with arches 210 ft. high and 368 ft. in span, and the entire floor area, including galleries, nearly 40 acres. The train shed of the Pa. R.R. at Philadelphia has a roof 304 ft. span and 598 ft. long, while that at Jersey City is 256 ft. span and 653 ft. long.

Roof Truss. Truss, containing tensile and compressive members, for supporting the roof covering of a building. See ROOFS.

Rooke, SIR GEORGE, R.N., 1650–1709. Rear-admiral 1689; knighted and pensioned for a battle with the French off Cape La Hogue 1692; prominent in war with Spain 1702 and the taking of Gibraltar 1704; engaged in a severe but indecisive battle with a French fleet off Malaga Aug. 1704; retired 1705.

Room. Portion of a coal mine in which the actual work of getting the coal is carried on; a breast or stall.

Roon, ALBRECHT THEODOR EMIL, GRAF VON, 1803–1879. Prussian Minister of War 1859–72 and of Marine 1861–71; reorganizer of the army; Count 1871, Field-marshal 1873.

Roosevelt, ROBERT BARNWELL, b. 1829. N. Y. Fishery Commissioner 1867; M.C. 1871–73; Minister to the Netherlands 1888–89; author of *Game Fishes*, 1860; *Game Birds*, 1866; *Florida*, 1868.—His nephew, THEODORE, b. 1859, U. S. Civil Service Commissioner 1889, Asst. Sec. Navy 1897, has pub. *Hunting Trips*, 1883; *War of 1812*, 1885; *Life of Benton*, 1887; *Ranch Life*, 1888; *Winning of the West*, 4 vols., 1889–95; *Hist. New York City*, 1891; *The Wilderness Hunter*, 1893.

Root. Descending axis of a plant. It is the organ which is most efficient in the absorption of water. It is generally entirely subterranean, but portions, or all of it, may be aerial. See SECONDARY ROOTS, AERIAL ROOTS, EPIPHYTES and PARASITES.

Root. In Philology, essential and primitive part of a word; monosyllabic, uninflected, without modifications of any sort, expressing the general idea at the basis of the word. It is the germ or nucleus of all later formations.

Root OF AN EQUATION. Value which, substituted for the unknown quantity, satisfies the equation.

Root OF A QUANTITY. One of its equal factors. The index of the root shows how many such factors enter into the quantity. A root is indicated by the radical sign $\sqrt{}$. Having the index of the root to the left and slightly above, as $\sqrt[3]{a}$, indicates the cube root of a; or by a fractional exponent having the index as the denominator, as $a.^{\frac{1}{3}}$, indicates the cube root of a. Roots are real or imaginary. Even roots of a negative quantity are imaginary: as two or any even number of negative factors give a positive product, there is no real factor, which, repeated an even number of times, will give a negative quantity. Any quantity has as many roots, real or imaginary, as the order of the root.

Root, GEORGE FREDERICK, Mus.Doc., 1820–1895. American composer of many popular songs.

Root, JESSE, 1736–1822. Delegate to Congress 1778–83; Chief-justice of Conn. 1796–1807. *Reports*, 1789–1802.

Root, OREN, D.D., L.H.D., b. 1838. Prof. Univ. Mo. 1866–71; pres. Pritchett Coll. 1871–80; Prof. of Mathematics, Hamilton Coll., 1881.—His brother, ELIHU, b. 1845, was U. S. Dist.-atty. in New York 1883–85.

Root and Branch Men. Opponents of Episcopacy in House of Commons 1641.

Root-Cap. Tip of an advancing subterranean root, composed of empty cells, pushed ahead by the formation of new ones immediately behind.

Root-Hairs. Cellular prolongations from the epidermis of roots. They form a very large portion of the absorbing surface.

Rootlets. Small roots, especially when the roots are numerous and all small.

Root Parasites. Plants which grow upon and derive their nourishment from the roots of other plants. Such are species of Thesium, the Rafflesias, and the broom rape or strangle weed, *Orobanche minor*, which develops upon the roots of many plants, especially that of clover in its second year.

Strangle Weed.

Rootstock. See RHIZOME.

Ropes. Ropes are made of manilla, of hemp, and of iron or steel with a hemp center. A hemp rope 1 in. in diameter has an ultimate strength of ab. 15,000 lbs., while one of wrought iron has 125,000 lbs. (see WIRE ROPE). Yarns are spun right-handed. Several yarns, formed into a strand or "ready," make it left-handed. Three strands laid up right-handed are called plain-laid or hawser-laid rope: four strands around a central core or heart of ab. ⅓ size of the strands are called shroud-laid; cable-laid is a left-handed rope of nine strands, each three being laid up in a group. Hemp makes the best ropes. To find strength of hemp rope in pounds, multiply the square of circumference in inches by 1371.4; or the breaking weight in tons = square of half the circumference. Ropes are known by their circumference measure.

Ropes, JOHN CODMAN, b. 1836. American writer on military history.

Roque, ST., d. 1327. Patron of plague patients.

Roquefort. Village of s.e. France, 44 m. n. by w. of Beziers; noted for its white cheeses.

Roqueplan, JOSEPH ÉTIENNE CAMILLE, 1802–1855. French genre and landscape painter.

Roraima. Isolated mountain in British Guiana on the Venezuelan frontier, rising on an immense parallelogram, 1,300–1,600 ft. high, with walls cut to the summit. Altitude 8,600 ft.

Rorke's Drift. In S. Africa, on the Tugela; defended by 80 British soldiers against 4,000 Zulus Jan. 22–23, 1879.

Rorquals. Whales with short, broad baleen plates, including Humpbacks, Finbacks, the California Gray Whale (30 to 70 ft. long), and the Sulphur Bottom or Razorback, the largest of living animals, ranging in length from 60 to 100 ft.

Rosa, CARL, 1842–1889. German violinist and manager, producer of English operas. See PAREPA-ROSA.

Rosa, PIETRO, ab.1815–1891. Italian archæologist and Senator, who did much for the study of Roman antiquities.

Rosa, SALVATOR, 1615–1673. Most romantic and inspired painter of the School of Naples; best in battle scenes and landscapes. His two best landscapes are in the Pitti Gallery at Florence, and have no superiors.

Salvator Rosa.

Rosaceæ. Natural family of flowering plants of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 79 genera and 1,200 species, widely dispersed throughout all parts of the earth; called the Rose family.

Rosaceous. Corolla of plants of the *Rosaceæ*, having

broad rounded petals on very short claws; also flowers similar to roses.

Rosaniline. See FUCHSINE.

Rosa of Lima (ISABEL FLORES), 1586–1617. Peruvian nun, canonized 1671.

Rosario. City of the Argentine Republic, on the w. bank of the Parana; founded 1725. It has a large trade in grain, cattle, wool and hides, which it exports direct to Europe. Its growth and importance are of the last half century. Pop. ab. 75,000.

Rosary. 1. String of beads on which prayers are counted; used by Christians, Mohammedans, Buddhists, and Brahmins. The Mohammedan rosary has 100 beads; that universally employed by the Buddhists, as well as the Brahminical rosary used in Vishnu and Krishna worship, have 108. The rosary is clearly an inheritance from primitive conditions, and its original significance was cosmical, the beads referring to the various divisions of the terrestrial and celestial circuits. In R.C. Ch., the string usually has 5 beads for Paters and 50 for Aves, to keep tally of prayers repeated; it was probably brought to Europe from the East by Crusaders. 2. Set of R.C. prayers, each including 5 Paters, 5 Glorias, 50 Aves, and 5 Meditations. This is the lesser rosary, 3 of which constitute the greater.

Rosas, JUAN MANUEL DE, 1793–1877. Dictator of Buenos Ayres 1835–52, ruling by fear and blood; invader of Uruguay 1839 and later; attacked by England and France 1845; overthrown by a coalition with Brazil; in England from 1852; denounced by Argentine Congress 1861 as a murderer and robber.

Rosazurine B. $C_{36}H_{30}N_6O_6S_2Na_2$. Sodium salt of the compound, formed by the action of the diazo compound of tolidine on a methyl-β-naphtholsulphonic acid. It dyes cotton red without mordant, and is a brown powder. Other similar rosazurines are known.

Rosbeke. Village of Flanders, where Philip van Artevelde with 20,000 Flemings was defeated and slain by the French Nov. 27, 1382.

Roscelin, or RUCELINUS, ab.1050–ab.1122. French priest, Canon of Compiègne, condemned at Soissons 1092 for tritheism; teacher of Abelard, with whom he had a violent controversy; supposed founder of Nominalism.

Roscher, WILHELM GEORG FRIEDRICH, Ph.D., 1817–1894. Prof. Göttingen 1843, and Leipzig from 1848; prolific writer on political economy, of the historical school. *System der Volkswirthschaft*, 1854–88; *Geschichte der Nationalökonomie in Deutschland*, 1874.

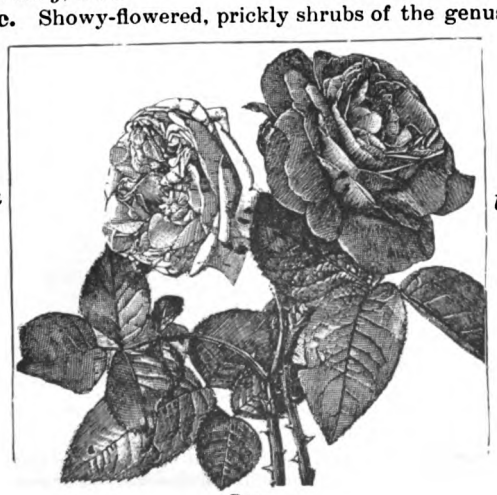
Roscius, QUINTUS, d. 62 B.C. Greatest of Roman actors; most eminent in comedy.

Roscoe, WILLIAM, 1753–1831. English biographer of Lorenzo di Medici 1796, and Leo X. 1805. *Poems*, 1857.—His grandson, SIR HENRY ENFIELD, LL.D., D.C.L., F.R.S., b. 1833, Prof. of Chemistry at Owens Coll., Manchester, 1858–86, M.P. 1885, was knighted 1884. *Spectrum Analysis*, 1868; *Elementary Chemistry*, 1870.

Roscoelite. Rare mineral, resembling small scales of brown or greenish-brown mica, and containing an unusually large percentage of vanadium. It has been found in small quantity associated with gold in California.

Roscommon, WENTWORTH DILLON, EARL OF, ab.1633–1684. Irish poet. *Essay on Translated Verse*, 1660; tr. Horace's *Art of Poetry*, 1684.

Rose. Showy-flowered, prickly shrubs of the genus *Rosa*,



Rose.
a, Tea-rose; *b*, Hybrid perpetual.

natural family *Rosaceæ*, widely distributed throughout the n. temperate zone, and extensively cultivated for ornament. Their characteristics are shrubby growth, prickly stems, terminal flowers and leaves alternate. In color they are white, pink, yellow or red.

Rose, ERNESTINE LOUISE LASMOND (POTOWSKI), 1810–1892. Polish-American reformer, active for Woman's rights.

Rose, GUSTAV, 1798–1873. German mineralogist, widely known for his researches on the relations between crystalline form and physical properties. His *Mineral System*, 1852, is based on crystallographic and chemical principles. *Elemente der Krystallographie*, 1833. The science of Petrography originated with him, and he was the first to teach the method of studying rocks by means of their microscopic sections.—His brother, HEINRICH, 1795–1864, prof. Berlin from 1822, was eminent as an analytical chemist. *Handbuch*, 1829.

Rose, HUGH JAMES, 1795–1838. Prof. Durham 1833; pres. King's Coll., London, 1836; ed. *Encyc. Metropolitana*, 1836; active in the Tractarian movement, though a Cambridge man.

Rose, SIR JOHN, b. 1820. Canadian official, in England since 1869; knighted 1870.

Rose, THOMAS ELLWOOD, b. 1830. Col. U. S. Vols. 1863; organizer of a famous escape from Libby prison, Richmond, Feb. 1864.

Rose-Acacia. *Robinia hispida*. Bristly-stemmed shrub of the natural family *Leguminosæ*, bearing showy, rose-colored flowers, native of the s. Alleganies; much planted for ornament; called also Bristly Locust.

Roseala. Bright, usually dark-red rash accompanied with little or no fever. It occurs usually in children and is sometimes mistaken for scarlet fever or measles. The absence of the throat symptoms distinguish it from the former and of the cold in the head from the latter. The eruption lasts for a few days, is never severe, and hardly needs any treatment.

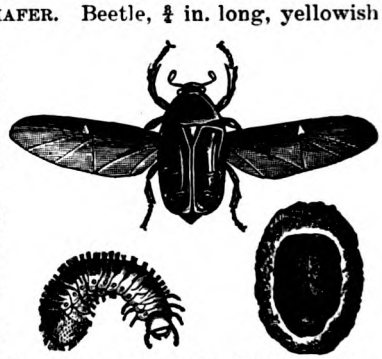
Rose Apple. *Eugenia jambos*. Small tree of the Myrtle family, native of the E. Indies, and cultivated in tropical countries for its ornamental flowers and fruit.

Rose-Bay. See RHODODENDRON and OLEANDER.

Rose Bengal. $C_{20}H_4Cl_2I_4O_5K_2$. Potassium salt of tetraiododichlorfluorescein, made by the action of iodine on dichlorfluorescein; brown powder, easily soluble in water. It dyes wool red in an acid bath.

Rosebery, ARCHIBALD PHILIP PRIMROSE, LL.D., EARL OF, b. 1847. Fifth Earl 1868; Foreign Sec. 1886 and 1892; Premier 1894.

Rosebug, or ROSE-CHAFER. Beetle, $\frac{3}{4}$ in. long, yellowish brown. It feeds on leaves, fruit, and flowers, preferring the rose. They appear on grapes about the time Concords are in bloom, and may be checked by spraying with water at 130° F., or whale-oil soap; or they can be collected by knocking off into sheets and killing with kerosene.



Rosebug, or Rose-chafer (*Cetonia aurata*), larva and cocoon.

Rosecrans, WILLIAM STARKE, U.S.A., b. 1819. Prof. at West Point 1843–47; Brig.-gen. 1861, Major-gen. U. S. Vols. 1862. He commanded the army of the Mississippi 1862, winning the battles of Iuka and Corinth, and that of the Cumberland, defeating Bragg at Murfreesboro Jan. 2, 1863, but beaten at Chickamauga Sept. 19–20. In 1864 he drove Price from Mo. He resigned from the army 1867; was Minister to Mexico 1868–69; M.C. from Cal. 1881–85, and Register U. S. Treasury 1885–93.

Rose Gall. Gall produced on roses by an insect. See GALLICOLA.

Rosegger, PETRI KETTENFEIER, b. 1843. Austrian novelist and poet, dealing with humble life in Styria.

Roseine. Usually rosaniline acetate; sometimes FUCHSINE (q.v.).

Roselius, CHRISTIAN, 1803–1873. Head of La. bar; Prof. Civil Law in Univ. La. from 1850.

Roselli, COSIMO, 1439–1507. Florentine painter. He has frescoes in the Sistine Chapel at Rome.

Rosellini, IPPOLITO, 1800–1843. Prof. Pisa 1824; in Egypt with Champollion 1827–28. *Monuments of Egypt and Nubia*, 12 vols., 1832–44.

Roselly de Lorgues, b. 1805. French author. *Christ before the Age*, 1835; *The Cross*, 1844; *Columbus*, 1856–85.

Rosemary. *Rosmarinus officinalis*. Shrub of the Mint

family, native of s. Europe; cultivated for its essential oil, used in perfumery; anciently used as a love charm, and regarded as an emblem of remembrance.

Rosen, FRIEDRICH AUGUST, Ph.D., 1805–1837. Prof Univ. London 1829. *Radices Sanscritæ*, 1827; ed. *Vedas*, 1836–38.

Rosendale Cement. Natural hydraulic cement, manufactured out of limestone from the Rosendale quarries near Rondout, N. Y.; also often any natural hydraulic cement. It is quicker setting but not as strong as the artificial Portland cement. See CEMENT and CEMENT TESTS.

Rosenkranz, JOHANN KARL FRIEDRICH, Ph.D., 1805–1879. Prof. Halle 1831, and Königsberg from 1833; historian of poetry and philosophy. *Hegel*, 1844–70; *Pedagogics*, 1848, tr. 1886.

Rosenmüller, JOHANN GEORG, 1736–1815. Prof. Erlangen 1773. Giessen 1783, Leipzig 1785; voluminous theologian. *Scholia in N.T.*, 10 vols., 1777–90.—His son, ERNST FRIEDRICH KARL, 1768–1835, Prof. Leipzig 1796, pub. *Scholia in V.T.*, 16 vols., 1788–1817, and *Analecta Arabica*, 1824–27.

Rosenmüller's Organ. See EPO-OPHORON.

Rose-Noble. English gold coin, minted ab. 1340–1420; value ab. $1.65.

Rosenthal, ISIDOR, b. 1836. Prof. Erlangen 1867; writer on physiology and biology.

Rosenthal, MORITZ, b. 1833. Prof. Vienna 1875; writer on the nerves.

Rose of Jericho. See RESURRECTION PLANT and ALTHÆA.

Rose of Sharon. *Hibiscus syriacus.* Ornamental malvaceous plant. The one mentioned in the Bible was probably a kind of narcissus. See RESURRECTION PLANT.

Roseroot. *Sedum roseum.* Fleshy herb of the natural family *Crassulaceæ*, growing in rocky places in the colder and Alpine regions of the n. hemisphere.

Roses, WAR OF THE. 1455–85, between princes of the houses of York and Lancaster, each claiming the throne by descent from Edward III. The York rose was white; that of Lancaster red.

Rose's Metal. Easily fusible alloy consisting of lead 1, tin 1, and bismuth 2. It expands up to 44° C., then contracts up to 69° C., when it has less volume than at 0° C., and then expands up to its mpt. 94° C.

Rose Quartz. Pink or pale red variety of quartz, transparent, and crystalline in structure. The color is supposed to be due to the presence of manganese. The mineral is commonly too easily cracked to be of use as an ornament.

Rosetta. Town of Egypt, near the Nile's mouth; taken by the French 1798; by the British and Turks April 19, 1801. The R. stone, discovered here 1799, received much attention, and was important in the study of hieroglyphics. It contains a tritingual inscription (hieroglyphic, demotic, and Greek) by means of which, aided also by a bitingual inscription on an obelisk, Champollion in 1822 obtained clews leading to the decipherment of the hieroglyphic writings. It is now in the British Museum.

Rosette. 1. Ambulacral areas of the dorsal surface of echinoids. 2. In Sponges, spicule consisting of several equal axes, each of which is terminated by trichites.

Rosette. In Botany, tuft of leaves arranged something like the petals of a doubled rose.

Rosetti, CONSTANTIN, 1816–1885. Roumanian poet, journalist, deputy, official, and senator.

Rose Water. Product obtained when rose petals and water are distilled. Sometimes oil of roses is used instead of petals.

Rose Window, or WHEEL WINDOW. In Gothic Architecture, a circular opening decorated with tracery, sometimes composed of circles and segments of circles, and sometimes arranged with reference to base radiating from the center like the spokes of a wheel.

Rosewood. Timber of numerous trees of tropical regions. The best is considered to be obtained from species of *Dalbergia*, natural family *Leguminosæ*, natives of tropical America.

Rosherville Gardens. Pleasure resort near Gravesend, Eng., formed by Mr. Rosher in old chalk-quarries.

Rosicrucians. Mystification, describing the disciples of the Rosy Cross as a wonderful society of semi-magicians and healers; set afloat probably by J. V. Andreä 1614. The pamphlet, *Fama Fraternitatis*, made a great sensation and led to much controversy. This and other works, 1615–16, professed to describe a society founded 200 years before by Christian Rosenkreutz, who had acquired the wisdom of the East by travel in Arabia and Egypt. Besides its medical secrets, it possessed the art of making gold.

Rosin. See COLOPHONIUM.

Rosin Bible. Name given to the Douay Bible, from Jeremiah viii. 22. See DOUAY VERSION.

Rosini, GIOVANNI, 1776–1855. Italian critic, poet, and writer of historical romances.

Rosin Plant. Coarse yellow-flowered herbs of the genus *Silphium*, of the Composite family, with an abundant resinous juice, natives of N. America.

Rosmini, ANTONIO, 1797–1855. Tyrolese priest, founder of an Institute of Brethren of Charity, 1830, for clerical education; philosophic writer of high grade, much calumniated and greatly honored. *Origin of Ideas*, 4 vols., 1830, tr. 1883–84; *Philosophic System*, 1845, tr. 1882; *Psychology*, 1846–48, tr. 1884–88; *Theosophy*, 5 vols., 1859–74.

Rosny, LEON DE, b. 1837. Prof. Paris 1868; writer on Chinese and Japanese philology and antiquities.

Rosolan. See MAUVE.

Rosolic Acid. $C_{20}H_{16}O_3$. Methylaurine. The pure acid can be made from rosaniline by diazotizing it. Commercially, it is not to be distinguished from AURINE (q.v.), in which it is present. It is used as an indicator in volumetric analysis. See CORALLIN.

Ross, ALEXANDER, 1699–1784. Scottish poet. *Helenore*, 1768.

Ross, ALEXANDER MILTON, b. 1832. Canadian naturalist.

Ross, EDMUND GIBSON, b. 1826. U. S. Senator from Kansas 1866–71; Gov. of New Mexico 1885.

Ross, GEORGE, 1730–1779. Delegate to Congress from Pa. 1774–77; signer of the Declaration of Independence.

Ross, JAMES, 1762–1847. Pa. Federalist, prominent in suppressing the whisky rebellion of 1794; U. S. Senator 1794–1803.

Ross, SIR JOHN, R.N., 1777–1856. Scottish Arctic explorer 1818 and 1829–33; knighted 1834; Rear-admiral 1851, after an expedition in search of Sir John Franklin *Voyage of Discovery*, 1819; *Navigation by Steam*, 1828; *Narrative*, 1835.—His nephew, SIR JAMES CLARK, R.N., F.R.S., 1800–1862, bore part in several Arctic voyages, discovered the north magnetic pole 1831, conducted a magnetic survey of the British isles 1835–38, explored the Antarctic seas 1839–43, was knighted 1844, and went in search of Franklin 1848. *Narrative*, 1847.

Rear-admiral Sir John Ross, K.C.B.

Ross, JOHN, ab. 1790–1866. Cherokee chief, leader in opposing the removal of his tribe from Ga. 1835.

Ross, SIR JOHN, b. 1829. English general, prominent in the Afghan war 1878–80; knighted 1880; Lieut.-gen. 1886; commanding in Canada 1888.

Ross, LUDWIG, 1806–1859. Prof. Halle 1845; student of Greek archæology.

Ross, ROBERT, 1770–1814. British officer, who won an action at Bladensburg, Md., Aug. 24, 1814, burned Washington, and was killed near Baltimore.

Ross, SIR WILLIAM CHARLES, R.A., 1794–1860. English painter, chiefly of miniatures, knighted 1842.

Rossall College. Public school founded 1844 on the coast of Lancashire, 2½ m. s.w. of Fleetwood, Eng. It has ab. 30 professors and ab. 400 students.

Rossbach. Village of Prussian Saxony, 22 m. w. by s. of Leipzig; scene of a rout of French and Austrians, Nov. 5, 1757, by Frederic II.

Rossbrunn. Village of Bavaria, scene of a Prussian victory July 26, 1866.

Rosse, WILLIAM PARSONS, 3D EARL OF, 1800–1867. M.P. 1821; Earl 1841; Peer for Ireland 1845; pres. Royal Society 1848–54; noted for his scientific researches, especially in Optics and Astronomy. In 1842 he constructed his great reflecting telescope of 6 ft. aperture, which is mounted at his observatory, Parsonstown, Ireland.

Rossel, ELIZABETH PAUL EDOUARD DE, 1765–1829. French Rear-admiral 1822; editor of several books of voyages and discoveries.

Rosselli, COSIMO. See ROSELLI.

Rossellini, BERNARDO, 1409–1464. Florentine sculptor and architect, restorer of many churches.

Rosser, THOMAS LAFAYETTE, b. 1836. Brig.-gen. C.S.A. 1863; Major-gen. 1864; prominent as a cavalry commander in Va.; chief engineer Canadian Pacific R.R. 1881–82.

Rossetti, CHRISTINA, 1830–1894. English poet, eminent for delicacy of style and depth of feeling; daughter of Gabriele. *Goblin Market*, 1862; *Prince's Progress*, 1866; *Singsong*, 1872; *A Pageant*, 1881. In prose, *Stories*, 1870; *Speaking Likenesses*, 1874; *Letter and Spirit*, 1883. Her poems, collected 1890, are mainly lyrical and often devotional.

Rossetti, GABRIEL CHARLES DANTE, called DANTE GABRIEL, 1828–1882. Son of Gabriele; English poet and painter; one of the founders of the preraphaelite school; a mystic and transcendentalist, whose pictures have a markedly individual stamp and character, but are not wholly free from affectation and self-consciousness. As a poet he ranks best. *The Blessed Damozel* is his most noted lyric. *Letters*, 1896.

Rossetti, GABRIELE, 1783–1854. Italian poet and patriot, proscribed 1821; prof. King's Coll., London, 1827. *Dante*, 1826; *Anti-papal Spirit*, 1832.—His oldest child, MARIA FRANCESCA, 1827–1876, pub. *A Shadow of Dante*.—His second son, WILLIAM MICHAEL, b. 1829, tr. Dante's *Hell*, 1865, ed. Shelley, 1869, and other poets, and pub. *Fine Art*, 1867, and *Life of Keats*, 1887.

Rossi, ERNESTO, 1829–1896. Italian actor, noted in Shakespearian parts: in the U. S. 1881.

Rossi, FRANCESCO DE, 1510–1563. Italian painter.

Rossi, GIOVANNI, 1754–1827. Italian writer of fables, comedies, and art studies.

Rossi, GIOVANNI BATTISTA, 1822–1894. Italian archæologist, noted for researches in the Catacombs. *Inscriptions*, 1861–88; *Subterranean Christian Rome*, 1864–77.

Rossi, PELLEGRINO, 1787–1848. Prof. at Bologna 1812, Geneva 1815, and Paris 1833; French envoy to Rome 1845. *Penal Law*, 1830; *Constitutional Law*, 1836; *Political Economy*, 1840.

Rossini, GIOACCHINO ANTONIO, 1792–1868. Italian operatic composer, in whose works the characteristics of the national style reached their climax. He produced his first opera 1810 and his last 1829. After the last date he lived chiefly in Paris, composing only a few trifles and the famous *Stabat Mater*,

Rossini.

1832. His best works are *Tancredi*, 1813; *L'Italiana in Algeri*, 1813; *Il Barbiere di Seviglia*, 1816; *Otello*, 1816; *Cenerentola*, 1817; *La Gazza ladra*, 1817; *Mosè in Egitto*, 1818; *Semiramide*, 1823; *Guillaume Tell*, 1829. His operas number 38, exclusive of revisions.

Rossiter, THOMAS PRICHARD, 1817–1871. N.A. 1849. American painter.

Rosso, IL, 1494–1541. Italian painter, much employed in France, especially in decorating the Château of Fontainebleau.

Rost, REINHOLD, 1822–1896. German-English Orientalist.

Rostellate. Diminutive of rostrate.

Rostellum. Conical projection, armed with hooks, on the head of *Cestodes*, as in the Tapeworm.—In Orchidology, projection from the column of the flower which bears the pollen-masses.

Roster. 1. Army list. 2. List of classes and studies in a college or school.

Rostock. City and river-port of Mecklenburg-Schwerin, on the Warnow, 9 m. from the Baltic; old Hanse town. Its small coinage is abundant ab. 1600–1865. Its university, founded 1418, rebuilt 1867, has 40 instructors, ab. 420 students, and a library of 140,000 vols. Pop., 1890, 44,388.

Rostoff. 1. Town of s. Russia, on the Don, near its mouth; founded 1761; important for commerce and manufactures. Pop. ab. 70,000. 2. Town of central Russia, 129 m. n.n.e. of Moscow; noted for its annual fair. Pop. ab. 17,000.

Rostopchin, FEDOR VASILIWICH, COUNT, 1763–1826. Russian general, Gov. of Moscow 1812. He denied the burning of the city, except his own house. *Works*, 1853.

Rostra. Name of the pulpit or orator's seat in the Roman Forum, which was decorated with the prows of vessels taken from the enemy.

Rostrate. In Botany and Zoölogy, organ extended into a slender prolongation or beak.

Rostrum. 1. Beak or sucking organ of certain insects. 2. Anterior prolongation of the carapace of Lobsters.

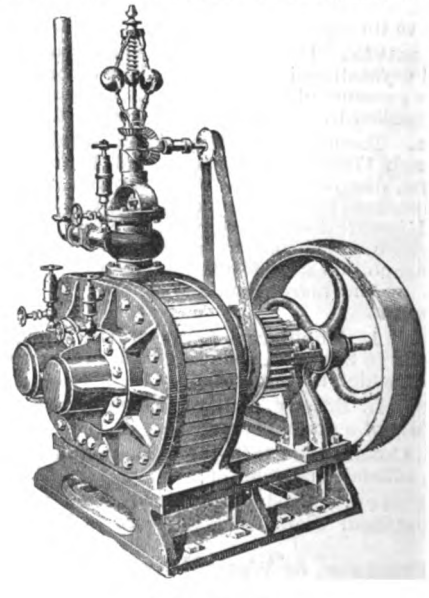
Rosulate. In Botany, organs arranged in a rosette.

Rosy Cross. See ROSICRUCIANS.

Rot. See SHEEP ROT.

Rotalidea. Order of perforate *Foraminifera*, with calcareous shells spirally coiled in such a way that all the turns are discovered upon one side and only the last turn upon the under side, where the terminal aperture is situated.

Rotary Engine. Steam engine in which it is sought to produce continuous rotation of the driving-shaft by the action of steam upon pistons borne at the end of a revolving crank in the cylinder. The steam enters at one point, acts upon the



Rotary Engine.

pistons by means of its pressure, and escapes at the opposite side, being obliged by the presence of an abutment (see ROTARY PUMP) to press so as to turn the shaft always in one direction, and to be prevented from passing from inlet to exhaust without doing work. The advantages of the rotary type of engine are direct application of the power on the shaft, compactness and portability, easy reversibility even from a distance, with no dead centers; all parts are inclosed within the casing, and not affected by weather or by missiles in quarry and similar work. The disadvantages are unequal wear of packing of pistons and consequent leakage, due to the different paths described by different points; excessive clearance and waste-room in the cylinder; the difficulty in attaining expansive working of the steam, and hence their extravagant use of steam; the difficulty in securing piston-area for large sizes, or, if area is obtained, adequate piston-speed. Expansive working of steam has been secured by compounding several engines on

the same shaft, each of larger size in succession and driven successively by the exhaust steam from the previous one. When packings and fit have worn somewhat, rotary engines are also noisy.

Rotary Gales. Those in which the winds gradually veer from one point of the compass to another until they have, at a given station, embraced a wide range of azimuth. See WHIRLWINDS and CYCLONES.

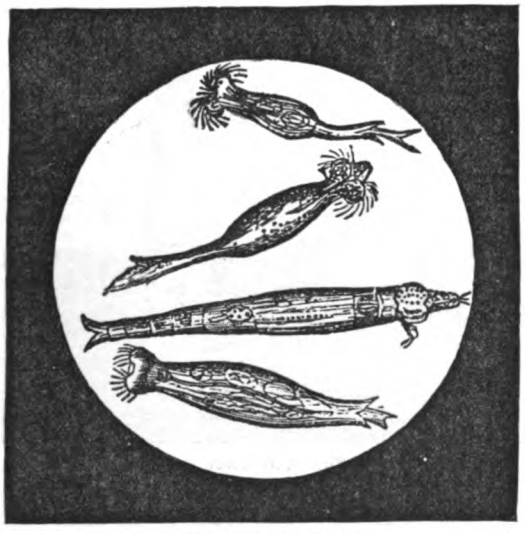
Rotary Pump. Machine for displacing water or other liquid by the continuous revolution of a piston or pistons rotating around a shaft. These pistons revolve in a casing, the two heads or ends being parallel, and the pistons fitting the heads fluid tight by means of packing or by a close fit. The pistons also fit such part of the casing as is cylindrical by similar means at their outer edge. Water enters at one side of the casing and leaves at the other. To separate the inlet and outlet parts of the casing, there has to be some sort of abutment or partition revolving with or displaced by the pistons, with which it shall always remain in water-tight contact. Such abutments are either revolving rings or else are a second series of revolving pistons, mates to the former, so that each functions alternately as piston and as abutment (see BLOWER). Such pumps deliver water continuously, can overcome considerable pressures, and have no shock from closure of valves. They are much used for fire purposes. See PUMP.

Rotate. Spreading wheel-shaped corolla of the Potato and related plants.

Rotation. Such motion of a body as takes place when every line in that body not parallel to a line called the axis of rotation is continually changing its direction, but without any motion, also of the body in the direction of that axis. Its velocity is called ANGULAR VELOCITY (q.v.).

Rotation of Crops. See CROP ROTATION.

Rotatoria (ROTIFERA, ROTIFERS; WHEEL-ANIMALCULES). Microscopic worms, with a conical body, whose posterior extremity forms a tapering segmented foot with forceps for attachment. The anterior end bears the trochal disk, on whose edge is a double circle of cilia. The mouth leads into a gizzard or mastax, provided with teeth that appear constantly in



Rotifers, magnified.

motion. The anus opens at the junction of the foot and body. There is a cerebral ganglion, a true vascular system is absent, but excretory organs are present. The sexes are separate; the males are often small, or wanting; parthenogenesis takes place in many forms. There are four groups, ZYGOTROCHA, SCHIZOTROCHA, GASTRODELA, and HOLOTROCHA (q.v.).

Rotatory Polarization. See POLARIZATION.

Roth, ALBRECHT WILHELM, 1757–1834. Physician and botanist at Vegesack, near Bremen. *Tentamen Floræ Germanicæ*, 1788–1800; *Catalecta botanica*, 1797–1806; *Manuale botanicum*, 1830.

Roth, JUSTUS LUDWIG ADOLF, 1818–1892. German geologist, mineralogist and petrographer. His *Allgemeinen und Chemische Geologie*, 1879, treats especially of the rock-forming minerals, their composition, and their transformations.

Roth, RUDOLF VON, 1821–1895. Prof. Tübingen from 1856. *Vedic Literature*, 1846; *Sanskrit Dict.* (with Böhtlingk), 7 vols., 1852–75.

Rothe, JOHANN ANDREAS, 1688–1758. German hymnist.

Rothe, RICHARD, 1799–1867. Prof. Wittenberg 1828–39, Bonn 1849–54, Heidelberg 1839–49 and from 1854; theologian of a lofty and independent type, strongly anti-clerical, ignoring any distinction between sacred and secular. His *Beginnings of the Ch.*, 1837, made it the Church's function to spiritualize the state and then retire. His *Theol. Ethik*, 3 vols., 1845–48, identified morals with religion. His *Dogmatik*, 3 vols., 1870–71, made the Bible a mere record of revealed truth. *Sermons*, 1869–72, tr. 1877; *Still Hour*, 1872, tr. 1886.

Rothermel, PETER FREDERICK, 1817–1895. American historical painter.

Rothesay. Capital of Buteshire, 40 m. w. of Glasgow; noted as a summer resort, and for its ruined castle. Pop., 1891, 9,034.

Rothrock, JOSEPH TRIMBLE, M.D., b. 1839. Prof. of Botany in Univ. Pa. 1877. *Flora of Alaska*, 1867.

Rothschild, MEYER ANSELM, 1743–1812. Founder of a banking-house at Frankfort.—His son, NATHAN, 1777–1836, introduced the negotiation of foreign loans into England, and supplied the Allies against Napoleon with funds.—His son, LIONEL NATHAN, 1808–1879, was the first Jewish member of Parliament 1858–74.—His son, LIONEL NATHANS, b. 1840, was made a Baron 1885.

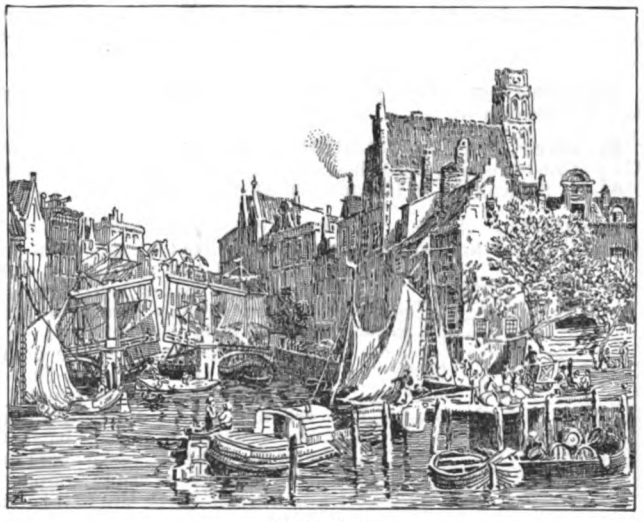
Rotifers. See ROTATORIA.

Rotrou, JEAN DE, 1609–1650. French dramatist. His best comedy is *Don Betrand;* his chief tragedies are *St. Genest* and *Venceslas;* the latter long held the stage. His 35 extant plays were collected in 5 vols., 1820–22.

Rotteck, KARL WENCESLAUS RODECKER VON, 1775–1840. Prof. Freiburg 1798–1832; deprived for liberalism. His *Universal History*, 9 vols., 1813–26, was highly valued.

Rottenstone. Soft and crumbly variety of stone, consisting chiefly of fine siliceous grains; used as a polishing material. See TRIPOLI.

Rotterdam. Important commercial city of s. Holland, on the Maas, 20 m. from its mouth; taken by Buderode 1488,



Rotterdam.

by Austrians 1489, and by Spaniards 1572; birthplace of Erasmus. It has varied manufacturing industries. Pop., 1890, 203,472, having nearly doubled in 30 years.

Rotunda. Space beneath a dome.

Rouarie, ARMAND TAFFIN, MARQUIS DE LA, 1756–1793. In the American service 1777–83; royalist leader in Brittany 1791–92.

Roubaix. Town of n. France, 6 m. n.e. of Lille, having large woolen manufactures; of recent growth. Pop., 1891, 114,917.

Roubillac, LOUIS FRANÇOIS, 1695–1762. French-English sculptor.

Rouble. Russian silver coin, unit of their system; valued at 100 kopecks, or (nominally) 77 cents.

Roudaire, FRANÇOIS ELIE, 1836–1885. French officer, author of the project (1873–76) of letting the waters of the Mediterranean into the Sahara.

Rouen. Ancient capital of Normandy, on the Seine, 87 m. n.w. of Paris; captured by Philip II. 1204, by Henry V. of England 1419, and by the French 1449. Joan of Arc was burned here 1431. It resisted Henry IV. 1592. The Cathedral and the Church of St. Ouen are famous specimens of Gothic archi-

tecture. The former was built 1200–20, and is 434 ft. long by 103 wide, 89 ft. high at the nave, and 470 in the transept. It contains the tomb of Richard Cœur de Lion. There are a public library of 110,000 vols., a picture gallery, a botanical garden, and large cotton and woolen manufactures. Pop., 1891, 112,352.

Rouge. See SONGKOI.

Rougé, OLIVIER CHARLES CAMILLE EMMANUEL, VICOMTE DE, 1811–1872. Keeper of Egyptian Antiquities at the Louvre 1849; prof. Coll. de France 1860. He wrote much on the monuments and inscriptions of Egypt.

Rouge et Noir, TRENTE ET QUARANTE, or TRENTE ET UN. Game of chance, invented in France in 1789, prohibited there 1838 and in Germany in 1872. It is played with 6 packs, the court-cards counting 10, the others, including the aces, according to the number of pips. The dealer deals cards for the Noir, laying them side by side, face upward, till their value is 31 or more; he then deals similarly for the Rouge. Whichever is nearer to 31 wins. Couleur wins if the first card dealt is of the some color as the winning color; Inverse wins if the first card is of the opposite color. The players therefore may win upon 2 of the 4 points. When the deals each amount to 31, the players pay half their stakes to the bank, or the whole is placed in Prison, to await the result of the next deal. The above is called Refait de trente-et-un, and the chance of its occurrence is 1 in 64. When the two deals are alike, 32 or more, neither the players nor the bank win. The name, taken from the colors of the suit marks on French and English cards, may be traced back through them to primitive culture, in which the two colors, one symbolic of life, day, and the masculine principle, the other of death, night, and the feminine principle, constantly occur as symbols in divinatory games. This game and Roulette are played at Monte Carlo.

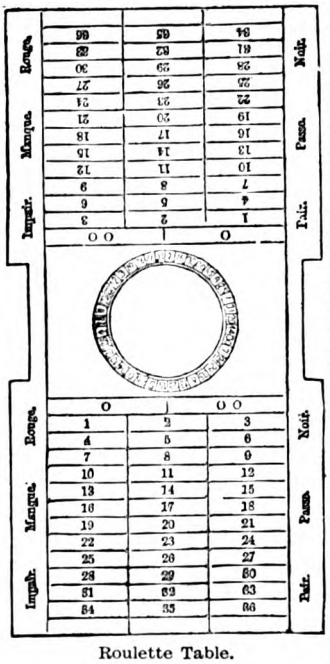
Rouget, GEORGES, 1781–1869. French historical and portrait painter.

Rouget de Lisle, CLAUDE JOSEPH, 1760–1836. Author of the *Marseillaise*, words and tune, April 25, 1792. His *Essais*, 1796, and other works are insignificant.

Rough-Cast. Thin plaster of lime and gravel, thrown on the outside of a wall.

Rouher, EUGÈNE, 1814–1884. Chief adviser of Napoleon III.; Minister of Justice 1849–52, of Commerce 1855–63, of State 1863–70; Senator 1856; Bonapartist Deputy 1872–75.

Roulette. Game of chance invented in Paris 1789, and forbidden 1838 and in Germany 1872; played by means of an ivory ball and a wheel in motion, the latter being set in motion in one direction and the ball in the inverse; the latter finally rolls into a compartment in the wheel. These compartments are alternately red and black, and are numbered from 1 to 36, with 0 and 00. The stakes are laid on the number of the compartment into which the ball rolls. If successful, the player receives 35 times the stake. Winning on one of a column of 12 numbers, as shown on the table, he receives 3-fold; on 6 numbers, 6-fold; 4 numbers, 9-fold; 3 numbers, 12-fold; 2 numbers, 18-fold; on Rouge red, Noir black, Pair even, Impair odd, Manque 1 to 18, Passe 19 to 36, he wins the amount of his stake. The ball in 0, those betting on Noir, Pair and Passe lose; those betting on Rouge, Impair and Manque have their bets in prison for the result of the next round. If the ball goes into 00, those betting on Rouge, Impair and Manque lose and the others stand over. One of these two last events happens once in 38 rolls, from which the bank derives a profit of 2½ per cent on all stakes, in addition to 5 per cent on the other stakes.



Roulette Table.

Roulettes. Curves traced by a fixed point connected with a curve which rolls without sliding upon any fixed curved base.

Roumania. Kingdom of s. Europe, formed 1859 by the union of Moldavia and Wallachia; area 49,463 sq. m. The country is mainly flat or undulating. The government is a limited monarchy. The capital is Bucharest. Prince Charles of Hohenzollern became its ruler 1866, and king 1881. The Dobrudja was added 1878, and Bessarabia taken by Russia. Pop. ab. 5,750,000.

Roumanian. See WALLACHIAN.

Roumelia. Turkey in Europe. "Eastern R." was joined to Bulgaria 1885.

Round-abouts. Progressive revolving gales of Redfield and Reid, or cyclones of modern meteorology; so called only in the Bermudas.

Roundheads. Puritans or Parliamentarians in England during the Civil War; so called by the Cavaliers from wearing their hair short, while Royalists wore it long.

Round House. Building, usually semicircular, for housing and cleaning locomotives, the walls being usually of brick, with wooden or iron roof-trusses. A turn-table in front serves to reverse all the locomotives, or to transfer any one to another track. Smoke-stacks are provided over each stall.

Round Robin. Remonstrance or petition signed in a circle, so that no one appears the leader in it; supposed to be of French origin.

Round Table. In Arthurian legend, made by Merlin, and given to Arthur at his marriage with Guinevere by her father. It seated 150 knights, and had a place also for the Holy Grail. There was a smaller Round Table for the accommodation of 12 favorite knights.

Round Tower. Built by Christians and for Christian purposes, between the 5th and 13th centuries. They are frequently described as bell towers and as treasuries and places

Round Tower, Ardmore, Ireland.

of refuge, and for the purpose of displaying lights. Most of them are found in Ireland and Scotland. In nearly all cases they seem to have been connected with a church.

Roundway Down. Hill in Wiltshire, near Devizes, Eng.; scene of a defeat of Waller and his parliamentary troops by royalists under Lord Wilmot, July 13, 1643.

Round-Worms. See NEMATHELMINTHES.

Roup. Disease of gallinaceous birds, existing in many forms. The symptoms are swelled eyes and heads, discharge from nostrils, hoarse breathing and drooping wings. It is incurable.

Rouquette, ADRIEN EMMANUEL, 1813–1887. R. C. missionary to La. Indians; poet, writing in French and English, as did his brother, FRANÇOIS DOMINIQUE, b. 1810.

Rous, FRANCIS, 1579–1659. Provost of Eton and M.P. 1643 lay member of the Westminster Assembly. His *Psalms* 1641, were recommended to that body by the Commons, and after revision by it and by two Scotch committees was adopted by the Kirk, which has used it since 1650.

Rousseau, JEAN BAPTISTE, 1670–1741. French lyric poet, banished 1712. *Works*, 1723.

Rousseau, JEAN JACQUES, 1712–1778. Swiss-French author of unquestioned genius and great influence, but of wandering and disreputable life. His principal books are *The New Heloïse*, 1760, a sentimental romance; *The Social Contract*, 1762, full of radical politics; *Emile, or Education*, 1762, which caused his condemnation and exile till 1770; and the extraordinary *Confessions*, partly written in England 1766–67, when sheltered by Hume. His *Works* were collected in 10 vols. 1764 and in 25 vols. 1822.

Rousseau and Madame D'Épinay.

Rousseau, LOVELL HARRISON, 1818–1869. Ky. lawyer and Senator; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862, serving in the West; M.C. from Ky. 1865–67; Brig.-gen. U.S.A. 1867.

Rousseau, PHILIPPE, 1816–1887. French painter, chiefly of animals.

Rousseau, PIERRE ÉTIENNE THÉODORE, 1812–1867. Greatest landscape artist since Constable, by whom he was influenced and inspired; leader in modern French landscape; long unrecognized by the French academic school; a poetic nature of vigorous power, broad execution, and absolutely true feeling in color.

Roussel, GERARD, ab.1480–ab.1550. French reformer; Bp. of Oleron 1536.

Rousset, CAMILLE FELIX MICHEL, 1821–1892. French historian; Academician 1871. *Louvois*, 4 vols., 1861–63; *Crimean War*, 1877; *Algeria, 1830–40*, 1887.

Routh, MARTIN JOSEPH, D.D., 1755–1854. Pres. Magdalen Coll., Oxford, from 1791. His *Reliquiæ Sacræ*, 5 vols., 1814–48, collected the fragments of Christian writers before 300, whose works in the main were lost.

Roveredo. Tyrolese town, on the Adige, 14 m. s. of Trent; scene of a French victory over Austrians Sept. 3–4, 1796; birthplace of Rossmini. Pop., 1890, 9,030.

Rovigo, DUKE OF. See SAVARY.

Rovuma. River of e. Africa, rising e. of Lake Nyassa and flowing e. to the Indian Ocean; explored 1862. Length ab.470 m.

Row, JOHN, ab.1525–ab.1575. Scottish reformer.—His son JOHN, 1568–1646, left a *History of the Kirk*, pub. 1842.

Rowan, JOHN. 1773–1853. M. C. from Ky. 1807–9; U. S. Senator 1825–31; Minister to Naples 1848–50.

Rowan, STEPHEN CLEGG, U.S.N., 1808–1890. Commodore 1862; active on the Atlantic coast 1861–64; Rear-admiral 1866.

Rowan-Tree. European Mountain-ash. *Sorbus aucuparia.*

Rowe, ELIZABETH (SINGER), 1674–1737. English sacred poet.

Rowe, NICHOLAS, 1674–1718. English dramatist; ed. Shakespeare 1709; tr. Lucan's *Pharsalia*, 1718. *Tamerlane*, 1702; *Jane Shore*, 1714.

Rowing. One of the most popular of modern pastimes. As a racing amusement it is principally continued by university boat clubs, though other amateur clubs and a few professional scullers engage in it. The favorite courses and distances are, in England, the Putney course on the Thames from Putney to Mortlake, four miles and a quarter, and the Henley course, a mile and five hundred yards. In America the favored courses are the Thames at New London, the Hudson at Poughkeepsie, the Connecticut at Springfield, and Saratoga Lake, each four miles; in Australia the Paramatta River, four miles. The records are affected materially by the fact that in a majority of these courses there is a more or less perceptible current. The record for the Putney course is 18 min. 47 sec., for New London 20 min. 10 sec., for Poughkeepsie 19 min. 29 sec., for Springfield 22 min. 2 sec. All these records were made by eight-oared crews in shells. The Oxford-Cambridge and Yale-Harvard rowing contests alone have lasted through a long succession of years; but the Henley races have also furnished a meeting-place where comparisons of style and speed during a term of years could be made.

Rowland, HENRY AUGUSTUS, b. 1848. Prof. of Physics at Johns Hopkins Univ. 1876; writer on magnetism.

Rowlandson, THOMAS, 1756–1827. English caricaturist, vigorous and coarse.

Rowley, WILLIAM, ab.1585–ab.1642. English dramatist.

Rowson, SUSANNA (HASWELL), 1762–1824. Anglo-American actress, novelist, and dramatist.

Rowton Heath, BATTLE OF. Near Chester, Sept. 24, 1645; royalist defeat.

Roxana, d. 311 B.C. Queen of Alexander 327 B.C.

Roxburgh, WILLIAM, 1759–1815. Director of the Gardens in Calcutta. *Flora Indica*, 1832.

Roxburghe Club. Practical prototype of the true BOOK CLUB (q.v.), instituted in England 1813, in commemoration of the sale of the Duke of Roxburghe's library. It prints MSS. and rare works for its members. At the Roxburghe sale the first edition of the *Decameron* brought £2,260, perhaps the highest price ever paid for a single printed volume.

Roxburghiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 3 genera and ab. 8 species of herbs, natives of the tropics of Asia and Australia, Japan, and Florida.

Roy, WILLIAM, 1726–1790. British Major-gen. 1781; Surveyor-gen. of coasts; pioneer of geodesy. *Military Antiquities*, 1793.

Royal, JOSEPH, b. 1837. Canadian editor, author, and legislator.

Royal Academy. Founded in London 1768; the Hibernian Academy in 1823, and the Scottish Academy in 1826. They are devoted to Art.

Royal Academy of Music. Founded 1823 in England by Lord Burghersh.

Royale, ISLE. Island of Mich., in Lake Superior. It has copper and silver mines.

Royal Geographical Society. Founded in London 1830. It has near 3,800 members.

Royal George. Vessel sunk at Spithead, Aug. 29, 1782, with Admiral Kempenfelt and nearly 900 men.

Royal Institution. Founded 1799 in England for the promotion of science, pure and applied, by lectures, and later by systematic teaching and research.

Royall, ISAAC, ab.1720–1781. Mass. loyalist, in exile from 1775; founder of the law chair at Harvard.

Royal Military Asylum. Educational government institution at Chelsea, Eng., established by the Duke of York 1803, and by whose name it is often known, for the education of sons, usually orphans, of British soldiers. A similar institution is at Dublin.

Royal Society. Outgrowth of meetings of men of scientific tastes, begun 1645; chartered 1662. It has now ab.500 Fellows and a library of near 50,000 vols., and publishes its *Proceedings* and *Philosophical Transactions*. A similar society, organized in Edinburgh 1783, has over 500 Fellows.

Royalty. Sum paid to the owner of a copyright, patent, or mine, on sales of the book or article, or amount of mineral produced.

Royce, JOSIAH, b. 1855. Prof. Harvard 1885. *California*, 1886; *Spirit of Modern Philosophy*, 1892.

Royce, STEPHEN, LL.D., 1787–1868. Judge Vt. Supreme Ct. 1829–46; Chief-justice 1846–52; Gov. 1854–56.—His nephew, HOMER ELIHU, b. 1820, was M.C. 1857–61, Judge of Vt. Supreme Ct. 1870–82, and then Chief-justice.

Roye, EDWARD JAMES, 1815–1872. Chief-justice of Liberia 1865–68; Pres. 1870.

Royer-Collard, PIERRE PAUL, 1763–1845. Prof. of Philosophy in Paris 1811; Deputy 1815; founder of the Doctrinaire school 1820; Academician 1827; pres. Chamber 1828.

Royle, JOHN FORBES, F.R.S., 1800–1858. Anglo-Indian botanist. *Himalaya Mts.*, 1839.

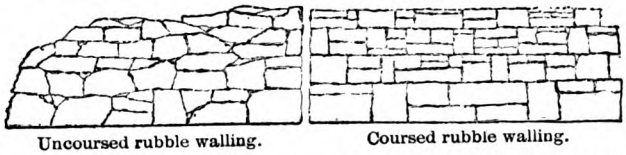
Ruatan, or RATTAN. Long, narrow island in the Bay of Honduras, belonging to Honduras since 1860. Area 106 sq. m., pop. ab. 2,000.

Rubber. See CAOUTCHOUC.

Rubber. Pad or cushion which in the earlier forms of electrical machines pressed against the glass cylinder or plate,

and by its contact with the moving surface generated the electricity. This cushion was made of leather, and was generally covered with an amalgam of zinc, tin, and mercury.

Rubble. Masonry formed of unsquared stones having only the rough projections knocked off, and laid either dry or with



Uncoursed rubble walling. Coursed rubble walling.

cement. It is often plastered on both sides, but only pointed externally. The cost is ab. $4 per cu. yard.

Rubefacients. Agents capable of producing redness of the skin and thus congestion by local contact. They are used to relieve undue irritability of deep-seated organs. Those most employed are heat, turpentine, capsicum, mustard, and ammonia.

Rubellane. Reddish product of the decomposition of the mineral biotite, once regarded as forming an independent mineral species.

Rubellite. Red variety of the mineral tourmaline.

Rubens, PETER PAUL, 1577–1640. Greatest Flemish painter. He studied in Italy, where he perfected himself in color. His *Descent from the Cross* is in the Antwerp Cathedral, and several of his best works in the Antwerp Gallery. His series of pictures in the Louvre, representing the life of Maria Medici, are inferior and largely by scholars. Outside of Antwerp his

The Descent from the Cross, by Rubens.

finest works are in Munich, but there are numerous examples elsewhere; *e.g.*, beautiful portraits at the Hague and in London. R. was an extremely prolific artist of vigorous and exuberant nature, sometimes tending to coarseness of type and form, but always vital and serious in his authentic work. His subjects are mainly religious, mythologic, or portrait, but his few landscapes are of the first rank. He was throughout life associated with princes, and often employed in their negotiations as ambassador.

Rubeola. See GERMAN MEASLES and MEASLES.

Ruberythric Acid. $C_{26}H_{28}O_{14}$. Lemon-yellow needles, obtained from madder-root by extracting with boiling absolute alcohol. It gives a golden-yellow solution in alcohol and a blood-red in alkalies. Rochleder considers rubian to be impure ruberythric acid.

Rubi, TOMAS RODRIQUEZ, b. 1817. Spanish writer of comedy.

Rubiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 375 genera and ab. 5,000 species, distributed throughout all parts of the earth; called the Madder family.

Rubian. $C_{26}H_{34}O_{15}$. Glucoside in madder-root. It is very soluble in water, but insoluble in ether. Its solution is very bitter, and, upon treating with baryta, yields RUBERYTHRIC ACID (q.v.).

Rubicelle. Yellow or yellowish-red variety of the mineral spinel.

Rubicon. Stream of n.e. Italy, by the passage of which Cæsar declared war against the Roman republic.

Rubidium. Rb. At. wt. 85.5, sp. gr. 1.52, mpt. 38.5° C., valence I.; discovered by Bunsen and Kirchhoff 1860 by means of the spectroscope; found in the mineral lepidolite; silvery-white metal with a yellowish tint. Its vapor is blue, it takes fire in the air, and decomposes water. It is made by the electrolysis of its chloride. The element and its compounds are rare.

Rubidium Bromide. Similar to the CHLORIDE (q.v.).

Rubidium Carbonate. Rb_2CO_3. White substance, mpt. 837° C. Its solution is strongly alkaline. It is made by treating the hydroxide with ammonium carbonate and evaporating.

Rubidium Chloride. RbCl. It crystallizes in cubes, sp. gr. 2.20, is soluble in water, and is made by neutralizing the hydroxide with hydrochloric acid.

Rubidium Hydroxide. RbOH. Grayish-white, porous, brittle substance, which melts and volatilizes at a red heat. Its solution has an alkaline taste and reaction. It is made by precipitating the sulphate with baryta water.

Rubidium Iodide. Similar to the CHLORIDE (q.v.).

Rubidium Nitrate. $RbNO_3$. Long needles or dihexagonal columns; made by neutralizing the hydroxide with nitric acid and evaporating. It melts at a red heat.

Rubidium Oxide. Ru_2O. Formed by the action of the air upon the metal. It ignites more readily than potassium.

Rubidium Sulphate. Rb_2SO_4. Large, hard, reflecting rhombic crystals, isomorphous with potassium sulphate and of similar taste. It decrepitates on heating, melts at a white heat, and is made by neutralizing the hydroxide with sulphuric acid.

Rubine. See ACID FUCHSINE.

Rubini, GIOVANNI BATTISTA, 1795–1854. Italian opera tenor, in Paris and London 1832–43.

Rubinstein, ANTON GREGOR, 1829–1894. One of the greatest of pianoforte players and most eminent of recent com-

Anton Gregor Rubinstein.

posers. His parents were Jews living in Russia. His teacher took him to Paris 1840, where Liszt advised him to complete his studies in Germany. For three years he made concert tours

in England, Scandinavia, and Germany, and in 1844 was sent to study composition in Berlin. Thence he was driven home by the revolution of 1848. Thereafter he devoted himself to teaching, conducting, composing, and concert-giving. In 1859 he became conductor of the Russian Music Society; in 1862 he founded the St. Petersburg Conservatory, of which he was director 1862 and 1887–90. He made a concert tour in the U. S. 1872–73. His compositions are numerous in all forms, and include several examples of a form half-way between opera and oratorio, which he called Biblical Opera. Of his operas the best known are *Feramors*, 1863, *Der Dämon*, 1875, and *Nero*, 1879. His *Ocean* and *Dramatic* symphonies have maintained places in the concert repertoires; his D minor concerto for pianoforte is a favorite work of its kind in all countries.—His brother NICHOLAS, 1835–1881, founded a music society in Moscow 1859 and in 1864 the Moscow Conservatory, of which he was director till his death.

Ruble. See ROUBLE.

Rublee, HORACE, 1829–1896. Ed. Madison, Wis., *Journal*, ab.1858–59; U. S. Minister to Switzerland 1869–77; ed. Milwaukee *Sentinel* from 1881; long chairman Republican State Committee; active reformer, and leading journalist of Wis.

Rubrics. Directions in a prayer-book; orig., titles of law chapters, written in red.

Rubruquis, WILLIAM OF, ab.1220–ab.1293. French monk, traveler in Asia 1253–54.

Ruby. 1. The oriental ruby is a deep red, transparent variety of corundum, next to diamond in hardness, and in

Ruby Mines in Upper Burmah.

some cases exceeding the diamond in value. The finest stones come from Pegu in Burmah. A few small gems have been found in the corundum of N. C. 2. Red spinels and garnets.

Ruby Blende. Red, transparent, crystallized variety of sphalerite.

Ruby Copper. More finely colored varieties of cuprite or red copper ore.

Ruby Silver. Pyrargyrite and proustite.

Ruchat, ABRAHAM, 1678–1750. Prof. Lausanne 1733. *Hist. Swiss Reformation*, 6 vols., 1727–28.

Rückert, JOHANN MICHAEL FRIEDRICH, 1788–1866. German lyric poet and translator, notable for fluency, philosophic thought, and oriental learning; prof. Erlangen 1826, and Berlin 1840–48.

Rudagi, FARID AD-DIN MUHAMMAD, ab.890–ab.954. Persian poet.

Rudbeck, OLOF, 1630–1702. Swedish historical and scientific writer; prof. Upsala. *Atlantica*, 4 vols., 1675–1702; *Campi Elysii*, 1701–2.

Rudder. See STEERING.

Ruddiman, THOMAS, 1674–1757. Scottish printer and librarian, ed. Livy 1751. *Latin Rudiments*, 1714. His *Grammar*, 1725–32, was long in use.

Rude, FRANÇOIS, 1784–1855. French sculptor.

Ruderal. Plants growing in waste places.

Rudimentary Organ. One not fully developed and of no use to the adult animal or plant, although it may have served a purpose in the embryo. In any case its presence is not disadvantageous enough to the animal or plant to have set in operation the forces that could remove it, whether through natural selection or otherwise.

Rüdinger, NICOLAUS, b. 1832. Prof. Munich 1881; writer on anatomy.

Rudini, ANTONIO DI, b. 1839. Italian Prime Minister 1891–92 and 1896.

Rudlieb. First European prose fiction; written ab.1050 in Latin verse, embodying old German hero-legends.

Rudolf I., 1218–1291. German emperor from 1273; son of Albert of Hapsburg; founder of the State and dynasty of Austria; capable and upright ruler.

Rudolf II., 1552–1612. Son of Maximilian II. and grandson of Charles V.; King of Hungary 1572, of Bohemia 1575; emperor 1576; feeble and bigoted. He persecuted Protestants, provoked revolts, and was practically deposed by his brother Matthias.

Rudolf, CHRISTOF, d. ab. 1550. German mathematician, author of an algebra, *Die Coss*, 1525. He introduced the radical sign.

Rudolf, LAKE. In e. Africa, lat. 2° 16′ to 4° 47′ N.; discovered 1888 by Count Teleki. Area 3,500 sq. m.

Rudolphine Tables. Astronomical calculations begun by Tycho Brahe and continued by Kepler; named from Rudolf II., who undertook the expense, but failed.

Rudra. In Vedic Mythology, a collective name of the gods of the tempest. In Puranic Mythology, a name of Siva, and Rudras are his offspring.

Rue. *Ruta graveolens.* Odorous herb of the natural family *Rutaceæ*, native of Europe, frequently cultivated in gardens. The volatile oil of rue is used in medicine.

Rue (*Ruta graveolens*).

Rue-Anemone. *Syndesmon thalictroides;* known also as *Thalictrum anemonoides;* vernal, white, or pink-flowered herb of the natural family *Ranunculaceæ*, native of e. N. America.

Rueda, LOPE DE, 1500–1565. Spanish dramatist and poet, styled by Cervantes "the great." *Pastorals*, 1576.

Ruff. Snipe-like bird of Europe, Asia and Africa. The males are adorned with a brilliant neck-shield during the

Ruff (*Totanus pugnax*).

pairing season, and fight for supremacy in their harems. Ruff is the male and Reeve the female. The shield, which can be

elevated, consists of stiff feathers, and is developed both for protection and to attract the females. Its color is most varied, ranging in different individuals from black through brown to white, with bars and streaks, and glossed with green and blue. These birds summer in n. Europe and Asia.

Ruffed Grouse. See GROUSE.

Ruffin, ARMAND GUSTAVE, 1731–1789. French explorer of the Amazon and Orinoco.

Ruffin, EDMUND, 1795–1865. Agricultural writer of Va. He fired the first shot at Fort Sumter 1861.

Ruffin, THOMAS, LL.D., 1787–1870. Chief-justice of N. C. 1829–52 and 1856–58.

Ruffner, HENRY, D.D., LL.D., 1789–1861. Prof. Washington Coll., Va., 1819–37, pres. 1837–48. *Fathers of the Desert*, 1850.

Rufiji, or LUFIJI. River in German e. Africa, flowing n.e. and e. into the Indian Ocean.

Rugby School. 83 m. n.w. of London; founded 1567. It has some 500 students and an income from endowment of ab. £5,000. Dr. Thomas Arnold, headmaster 1828–42, made it famous and influential.

Ruge, ARNOLD, 1802–1880. German Socialist, in England from 1849; prolific writer in prose and verse. *Aus früherer Zeit*, 4 vols., 1863–67.

Rugen. Prussian island in the Baltic. Grain and cattle are exported and the fisheries are important. Area 361 sq. m.; pop., 1890, 45,185.

Ruger, THOMAS HOWARD, U.S.A., b. 1833. Brig.-gen. U. S. Vols. 1862, serving in Va. and the West; supt. at West Point 1871–76; Brig.-gen. U.S.A. 1886; Major-gen. 1896.

Ruger, WILLIAM CRAWFORD, 1824–1892. Chief judge N. Y. Court of Appeals from 1882.

Ruggles, BENJAMIN, 1783–1857. U. S. Senator from Ohio 1815–33.

Ruggles, SAMUEL BULKLEY, LL.D., 1800–1881. New York lawyer; Canal Commissioner 1840–42 and 1858.

Ruggles, TIMOTHY, 1711–1795. Mass. loyalist, in exile from 1775.

Rugosa. Corals with many symmetrically arranged septa in multiples of four. They are all Palæozoic; *e.g.*, *Cyathophyllum*. The members of this group differ from the Madrepore corals in a few other particulars, as in having fossulæ and tabulæ, in budding from the calyx, and in the absence of cœnenchyma in compound forms.

Rugose. Wrinkled surfaces, especially those of some leaves and fruits.

Rugulose. Diminutive of Rugose.

Ruhmkorff, HEINRICH DANIEL, 1803–1877. German-French electrician, inventor of a thermo-battery 1844 and an induction coil 1851.

Ruhmkorff Coil. See INDUCTORIUM.

Ruhnken, DAVID, 1723–1798. Prof. Leyden 1761. Here he labored with Hemsterhuis, and annotated Greek and Latin authors, and aided in the spread of Greek learning. *Epistolæ Criticæ*, 1749–51.

Ruhr. River of w. Prussia, rising on the Belgian frontier, emptying into the Meuse at Rœrmond. Length 67 m.

Ruisdael, or **Ruysdael,** JACOB VAN, ab.1630–1682. Great-

The Swamp, by Jacob Ruisdael.

est Dutch landscape painter, of poetic and romantic temperament, who found in nature his own moods.—His father, IZACK, d. 1677, and uncle, SOLOMON, 1600–1670, were subordinate talents. His best pictures are in the Dresden Gallery.

Ruiz, JUAN, ab.1290–ab.1370. Spanish poet and satirist.

Ruiz Lopez, HIPOLITO, 1754–1815. Spanish botanist, author (with J. Pavon) of *Flora Peruviana et Chilensis*, 1798–1802; and *Systema vegetabilium Floræ Peruvianæ et Chilensis*, 1798.

Rule Britannia. Music by Arne, 1740; words by D. Mallet.

Ruled Surface. One generated by a straight line.

Rule Nisi. Rule to show cause. Mode of invoking the authority of the court to compel a party to do some act, unless (nisi) he shall show cause why he should not be so required. If he shows sufficient cause, the rule is said to be discharged.

Rule of Faith. In Polemical Theology, the sources whence the doctrines of the faith are to be authoritatively derived.

Rule of the Road. In U. S. and on the continent of Europe, keep to the right; in England, to the left, except in passing vehicles going the same way.

Rule of Three. Arithmetical form of proportion in which three terms are given to find a fourth; single or double as the ratios are simple or compound.

Rules, IN ETHICS. Laws of human action, dependent on the commands of some external power or of conscience.

Rules and Articles of War. By Section 1342, Revised Statutes of the U. S., the armies of the U. S. are governed by certain rules and articles embraced in 128 Articles of War. By Art. 128, these are to be "read and published once in every six months, to every garrison, regiment, troop or company in the service of the U. S., and shall be duly observed and obeyed by all officers and soldiers in said service." They are printed in the Army Regulations.

Ruling Elders. In Presbyterian churches, communicants chosen for life or a term, to assist the pastor in administering discipline.

Ruling Machine. See DIVIDING ENGINE.

Rum. Spirits distilled from a mash made of the skimmings from the sugar boilers and molasses, diluted with water to contain 12 to 16 per cent of sugar and fermented with the lees from the previous mash. The best quality is made in small stills. It is colored with caramel. It contains ab. 70 per cent alcohol. That made in Jamaica, St. Croix and British Guiana is most esteemed. The flavor is due to the butyric ether formed. New England rum is made from molasses, in Mass. and Conn. In 1894, there was made in U. S. 1,864,595 gals. of rum.

Rumble. Hollow barrel rotating around a horizontal axis perpendicular to its heads at their centers, in which small castings may be put and set to tumbling about for the removal of scabs of foundry sand from the molds; hence also called tumbling barrels; applicable to castings of small weight and without fragile detail.

Rumen. See PAUNCH.

Rumford, BENJAMIN THOMPSON, COUNT, 1753–1814. Scientist and statesman; b. at Woburn, Mass. Failing to receive a commission in the Continental Army, he went over to the British, and was sent with dispatches to England; came back in 1781, raised a Tory regiment in N. Y., and served in the Carolina campaign; resided in Bavaria 1783–99, where he held several high offices in the state, effected extensive reforms in the army and in various industries, and became a count of the Holy Roman Empire 1791, taking his title from the town in N. H. where he had lived. He was active in founding the Royal Institution of London, endowed a chair in Harvard, married Lavoissier's widow 1804, and lived at Auteuil, France. His studies and experiments on light, heat, etc., were very fruitful. His *Essays*, 1796–1802, were issued in 4 vols., 1876.

Rumi, JALAL ADDIN, 1207–1273. Persian poet. *Masnavi*, partly tr. 1881.

Ruminants. Animals like domestic cattle and sheep, deer, antelopes, and camels, in which the stomach is divided into compartments; viz., (1) the paunch, or rumen, for receiving the hastily swallowed food; (2) the reticulum, in which are cells for shaping the cuds. These are regurgitated and chewed until semifluid, and when swallowed pass between the lamellæ of (3) the psalterium, omasum, or manyplies into (4) the abomasum, where true digestion takes place. Ruminants are two-toed or cloven-hoofed ungulates, but they really have four toes; the two hindermost (or dew claws) do not reach the ground. Upper incisors are absent, and usually the canines also. The lower canines resemble the incisors, which project so as to press nearly flatwise against a hard pad in the upper jaw. Thus in grazing the herbage is torn off rather than bitten. See SELENODONTIA.

RUSSIA
IN EUROPE
Geographical Miles, 60 = One Degree
English Miles, 69 = One Degree
Railways thus
ARCTIC OCEAN
WAIGATZ ID.
Kara Sea
Waranger Fd.
Carlsgammen
L. Enara
Enara
Kola R.
Kola
C. Kanin
C. Sviatoi
KOLGUEV I.
KANINSKAIA PENA.
G. of Tcheskaia
NOVAIA ZEMLIA
Pustozersk
Samoied
Arctic Circle
Ust Usa
Obdorsk
R. Obi
R. Sinia
LAPLAND
KOLA PENINSULA
Pond R.
Gulf of Kandalak
L. Piavo
L. Topo
L. Kutno
Kemi
R. Kemi
Tornea
R. Torneå
Muonio
Muonioniska
Enontekis
R. Tana
Kemi L.
Tarva
Ijo R.
Uleaborg
Brahestad
L. Ulea
Kajaneborg
Kajana
Kajanoki
Gamla Carleby
Jacobstad
Nikolaistad (Wasa)
Walgrand
Gulf of Bothnia
Kasko
Narpes
Christinestad
L. Pielis
Pielis
Sego L.
L. Vigo
Povienetz
L. Vodlo
BIELOE MORE OR WHITE SEA
Mezen
Jukogorska
Archangel
Novo Dvinsk
Kholmogory
Onega
G. Onega
G. of Onega
R. Dvina
R. Pinega
R. Vashka
R. Mezen
U. Vaga
Shenkursk
Pokrovskoi
Yarenskoi
Veslensk
Ustiuga
Vetcha
R. Pitchora
Podtchoska
Ishma
R. Sova
Sosinsk
R. Vyatka
R. Kama
Orenburg
Ural Mts.
Ural R.
Sea of Azov
Cossacks of the Black Sea
Sarepta
Tcherniai Iar
Selitrenoi Gorodok
Ienotaevsk
Astrakhan
Kulpinsk
Mths. of the Ural
Mths. of the Volga
Mths. of the Terek
Alexandrovsk
Stavropol
Alexandrov
Georgievsk
Piatigorsk
Mashuk
Kislar
Petrovsk
Tarki
Derbend
R. Sainar
Kuba
Baku
C. Apsheron
Salian
Lenkoran
Shusha
Achuglan
R. Aras
Elizabetpol
Goktcha or Sivan
Gumri
Kars
Erivan
Olti
Erzerum
Trebizond
Batoum
Poti
Kutais
Tiflis
Akhalzika
Zalka
Vladikavkas
Unzuk
Kutais
Sinope
Erekli
Sevastopol
Simferopol
Eupatoria
Kertch
Kaffa
Yenikale
Kopul
Taman
Anapa
Ekaterinodar
Gelenjik
Mamai
Gogra
Pitsunda
Dukhum Kale
Anaklia
Kutais
Poti
Batoum
Sinope
Trebizond
Erzerum
Bosporus
Dardanelles
CONSTANTINOPLE
ASIA MINOR
TURKEY
BULGARIA
Varna
Burgas
Rustchuk
Silistria
Bucharest
R. Danube
WALLACHIA
RUMANIA
HUNGARY
Jassy
Kishinev
Bender
Ismail
Kilia
Akerman
Odessa
Kherson
Nikolaiev
Ekaterinoslav
Kinburn
Perekop
Berislavl
Melitopol
Mariupol
Birdiansk
Taganrog
Nakhitchevan
Rostov
Novo Tcherkask
Zumliansk
Kamensk
Bobrinetz
Lopatin
Alexandrovsk
Orekhov
Oviciopol
Olviopol
Elizabetgrad
Balta
Biamsk
Bytsy
Tammerfors
Biorneborg
Helsingfors
Weisklov
Finland
Sweden
Denmark
Gulf of Finland
Narva
Dorpat
Pskov
Novgorod
Tchudovo
Petrozavodsk
Petropavlovsk
Sherim
Baku
Astrakhan
Saratov
Samara
Ufa
Perm
Kazan
Nizhni Novgorod
Moscow
Tula
Kaluga
Smolensk
Vitebsk
Minsk
Mogilev
Kiev
Poltava
Kharkov
Kursk
Orel
Tambov
Voronezh
Saratov
Tsaritsyn
Kamyshin
Pensa
Simbirsk
Kazan
Vyatka
Ekaterinburg
Tobolsk
Tomsk
Omsk
Semipalatinsk
Kostanai
Orenburg
Uralsk
Astrakhan
Kulpinsk
Mths. of the Ural
Longitude East from Greenwich

Ruminant Stomach. See PAUNCH, RETICULUM, PSALTERIUM, and ABOMASUM.

Ruminated. Wrinkled surface of the endosperm of certain seeds, as those of the Papaw.

Rumohr, THEODOR WILHELM, b. 1807. Danish historical romancer.

Rump. Fag-end of the Long Parliament, after most of its members were expelled by Col. Pride Dec. 6, 1648, and is

Roasting the Rumps in Fleet Street (from an old print).

known as Pride's Purge. It sat till April 20, 1653, and for brief periods 1659 and 1660. See LONG PARLIAMENT.

Rumsey, JAMES, ab.1743–1792. One of the inventors of steam navigation. His vessel was tried on the Potomac 1784, and on the Thames 1792: societies were formed at Phila. and in England to promote the scheme.

Runcinate. Leaves with large lobes or teeth, which point backward.

Runeberg, JOHAN LUDVIG, 1804–1877. Finnish lyric, narrative, and dramatic poet of high rank; prof. Borga from 1837. His poetic romances, describing scenes from the second Finnish war, written in Swedish, are full of beauty and national feeling. *King Fjalar*, 1844; *Ensign Stal's Stories*, 1848–60.

Runes. Once subject of wildest theories; now known to be the alphabet of primitive Germanic (and other) tribes, and copied from the Roman alphabet of the empire. They were brought into the north ab.200. In our old speech rune means a mystery. Runic inscriptions are found in Denmark, Norway, Sweden, and to some extent in Germany and England; they abound on weapons, on memorial stones, and are of great importance for settling early forms of speech. The necessities of carving on stone changed the Roman curves to straight lines. A runic inscription, probably Old-Anglian, on a golden horn found at Gallehus, is probably the oldest line of poetry preserved in Germanic: Ek Hlewagastiz Holtingaz horna tawido—"I, Leogast, son of Holt, made the horn."

Runjeet Singh, 1780–1839. Ruler of the Punjab, n.w. India, from 1797. He made terms with the British, and by conquests built up a powerful state.

Runkle, JOHN DANIEL, LL.D., b. 1822. Prof. Mass. Institute of Technology from 1865, pres. 1870–78. *Analytical Geometry*, 1888.

Runner. In Botany, prostrate stem or branch which roots at the nodes.

Running. From the earliest times this was a sport which drew from all classes. The modern Marathon race is but a repetition of the Greek contest. Early English annals are full of races between gentlemen and between servants. One mile was run by W. G. George, England, in 4 min. 12¾ sec. The greatest distance run in one hour was 11 m. 1,234 yds., covered by F. E. Bacon, England, June 20, 1897. 100 yds. has been run in 9⅗ sec. by B. J. Wefers, American, 1897, 440 yds. in 47¾ sec. by W. Baker, American, ¼ m. in 1 min. 53⅗ sec. by C. H. Kilpatrick, American. The greatest distance in 6 days was 623 m., covered by G. Littlewood, England. The most popular running contests in America are the 100-yds., 220-yds., ¼-m., ½-m., 10-m., and the hurdle events; in England distance events, like the 3-m. and even the 5-m., are fancied. The older-fashioned sack races, three-legged races, and obstacle races have practically disappeared, save at village fairs.

Runnymede. Meadow on s. bank of the Thames, 35 m. above London, where King John was forced by the barons to sign Magna Charta, June 15, 1215.

Runyon, THEODORE, LL.D., 1822–1896. Brig.-gen. U. S. Vols. 1861; Chancellor of N. J. 1873–87; U. S. Minister to Germany 1893.

Rupee. Standard silver coin of India, in native states since ab.1544, and under British rule; nominally worth ab. 48 cents.

Rupert. Emperor of Germany 1400–10.

Rupert, PRINCE, 1619–1682. Son of Frederick V., elector Palatine, and grandson of James I.; brilliant cavalry officer in the English civil war; first governor of Hudson's Bay Co. 1670.

Rupert River. In Northeast Territory, Canada, connecting Lake Misstassinne with Hudson's Bay.

Rupestrine, or RUPICOLOUS. Plants growing naturally on rocks.

Rupp, ISRAEL DANIEL, 1803–1878. Historian of many Pa. counties.

Ruprecht, FRANZ J., 1814–1870. Curator of Herbarium of Royal Academy of Sciences in St. Petersburg. *Algæ Ochotenses*, 1850; *Flora boreali-uralensis*, 1847–48; *Flora Caucasi*, 1869.

Rupture. Breaking of a material by compression, tension, shear, or flexure. In a testing machine it is done by a stress applied with uniformly increasing intensity. A stress suddenly applied produces a more granular fracture than one slowly applied. See TESTING MACHINE.

Rupture. See HERNIA.

Rural Dean. English parish priest having some slight supervisory authority over part of a diocese.

Rurik, d. ab.879. Founder of the first Russian dynasty, lasting till 1598; Varangian (Scandinavian) chief, who came by

Rurik, founder of the Russian Empire.

invitation to Novgorod 862; annexed the dominions of his two brothers, took the title of grand-prince, and subdued the Slavonic tribes about him.

Rush. Grass-like plants of the genus *Juncus* and natural family *Juncaceæ*, of wide geographical distribution.

Rush, HORNED. *Rynchospora corniculata*. Large plant of the Sedge family, native of e. N. America.

Rush, BENJAMIN, M.D., LL.D., 1745–1813. Prof. Phila. Medical Coll. 1769; delegate to Congress 1776; signer Declaration of Independence; Surgeon-gen. of the army 1777–78; a founder of Phila. Dispensary, Coll. of Physicians, and Dickinson Coll. at Carlisle; member of Pa. Conventions 1787; eminent as a teacher and practitioner, especially in the yellow fever 1793. *Medical Inquiries and Observations*, 5 vols., 1789–98; *Essays*, 1798; *Diseases of the Mind*, 1812.—His son, RICHARD, 1780–1859, was U. S. Atty.-gen. 1814–17; Minister to England 1817–25, and negotiator of important treaties; Sec. U. S. Treasury 1825–29; Commissioner to England 1836–38, when he secured Smithson's legacy; Minister to France 1847–51. *Court of London*, 1833–45.—His brother, JAMES, M.D., 1786–1869, founded the Ridgeway branch of Phila. Library: his wife, PHŒBE ANN (RIDGEWAY), 1797–1857, was prominent as a social leader.

Rush, WILLIAM, 1756–1833. Wood-carver of Phila., preeminent in his day, especially by his figure-heads for vessels.

Rushworth, JOHN, ab.1607–1690. English compiler of Historical Collections (1618–48), 7 vols., 1659–1701, repub. 1721.

Rusk, JEREMIAH MCLAIN, 1830–1893. M.C. 1871–77; Gov. of Wis. 1882–88; U. S. Sec. of Agriculture 1889–93.

Rusk, THOMAS JEFFERSON, 1802–1856. Sec. of War of Texas 1836; judge Texas Supreme Court 1838–42; U. S. Senator from 1846.

Ruskin, JOHN, LL.D., D.C.L., b. 1819. English art critic; noted for his brilliant style, extreme and erratic views, and advocacy of Turner. *Modern Painters*, 5 vols., 1843–60; *Seven Lamps of Architecture*, 1849; *Pre-Raphaelitism*, 1851; *Stones of Venice*, 3 vols., 1851–53; *Lectures*, 1870–93.

Russell, ARTHUR TOZER, 1806–1874. English hymnist; biographer of T. Fuller, 1844, and Bp. Andrewes, 1859.

Russell, BENJAMIN, 1761–1845. Ed. *Columbian Centinel*, 1784–1828, and Boston *Gazette*, 1795–1830.

Russell, CHARLES, BARON, b. 1833 in Ireland. Q.C. 1872; eminent as a pleader; M.P. 1880; knighted 1886; Atty.-gen. 1886 and 1892; baron and Lord Chief-justice 1894.

Russell, DAVID ALLAN, U.S.A., 1820–1864. Brig.-gen. U.S. Vols. 1862; killed near Winchester, Va.

Russell, HENRY, b. ab.1810. English singer and composer of songs, long in America.

Russell, ISRAEL COOK, b. 1852. Assistant in U. S. geological survey from 1878, partly in Alaska; prof. Univ. Mich.

Russell, JOHN, 1745–1806. English portrait painter, R.A. 1780.

Russell, JOHN, LORD, 1792–1878. M.P. from 1813; Whig leader, prominent in the repeal of the Test and Corporation acts 1828, Catholic emancipation 1829, and the Reform Bill 1832; Home Sec. 1835–39; Sec. for War and the Colonies 1839–41; leader of opposition 1841–45; Prime Minister 1846–52 and 1865–66; Foreign Sec. 1852 and 1859; Colonial Sec. 1855; biographer of Lord Wm. Russell, 1819, and C. J. Fox, 1859–66; editor of other memoirs.

Russell, JOHN HENRY, U.S.N., 1827–1897. Distinguished on the Gulf 1861–62; Commander 1867, Captain 1874, Commodore 1883, Rear-admiral 1886.

Russell, JOHN SCOTT, F.R.S., 1808–1882. Scottish engineer; builder of the *Great Eastern*. *Naval Architecture*, 1864.

Russell, JONATHAN, 1771–1832. U. S. Minister to Sweden 1814–18; M.C. from Mass. 1821–23.

Russell, WILLIAM, LORD, 1639–1683. English patriot, who advocated the bill excluding James as a papist from the succession; falsely accused of participation in the Rye House Plot; arraigned for treason; condemned upon perjured testimony and beheaded.—His wife, RACHEL (WRIOTHESLEY), 1636–1723, a model of fidelity, left *Letters*, pub. 1773.

Russell, WILLIAM, 1758–1825. Ky. pioneer, prominent in several campaigns; commander on the frontier 1811–12.

Russell, WILLIAM, 1798–1873. Scottish-American elocutionist, teacher, writer, and lecturer.—His son, FRANCIS THAYER, b. 1828, has been Prof. of Elocution at Middletown, Conn., and in New York.

Russell, WILLIAM CLARK, b. 1844 in N. Y. English marine novelist. *John Holdsworth*, 1874; *Wreck of the Grosvenor*, 1877; *The Lady Maud*, 1882; *Marooned*, 1889; *A Three-stranded Yarn*, 1895.

Russell, WILLIAM EUSTIS, 1857–1896. Gov. of Mass. 1890–93; prominent as a reformer. *Speeches*, 1894.

Russell, WILLIAM HOWARD, LL.D., b. 1821 in Ireland. Special correspondent of the London *Times* in the Crimean, Indian, American, Austro-Prussian, and Franco German wars; author of diaries. *Dr. Brady*, 1868; *Hesperothen*, 1882; *Chile*, 1890.

Russia. Empire of e. Europe and n. Asia, comprising more than one-seventh of the habitable parts of the earth. It is popularly separated into four divisions, as below, with their estimated areas and population:

	Area sq. m.	Population
Russia in Europe . . .	2,060,940	88,356,572
Caucasus	178,839	7,084,017
Siberia	4,826,287	4,143,226
Central Asia	1,286,874	5,201,946
Total	8,352,940	104,785,741
Pop., 1897		129,211,113

The surface of European R. is one vast plain, extending from the Urals to the Baltic, from the Caucasus to the Arctic Ocean. That of Asiatic R. is elevated and mountainous in the s. and e., descending in the interior into broad semi-arid plains, the Steppes, which, becoming still lower, border the shores of the Arctic with immense areas of frozen swamp or tundra. The coast is everywhere broken with deep bays and peninsulas, and studded with islands. It contains many of the great rivers of the globe, the Volga, Obi, Yenesei, Lena, and Amoor, and several inland seas, such as the Caspian and Aral, and lakes Baikal and Balkash. The industries are in the main agricultural, and though a large part of the country is from soil or climate unfit for cultivation, and the processes somewhat rude, yet the product is enormous. Manufactures are not extensive, nor is foreign trade. Its internal trade is very great. The Ural Mts. contain much mineral wealth, gold, platinum, iron and copper being mined. Coal is found in the Crimea and the Urals, and salt is manufactured in several localities. Petroleum is abundant in the Caucasus. Railroads are being constructed by the government with almost unexampled rapidity. Sept. 1, 1896, 24,439 m. were in operation, 7,939 m. building. The government is an absolute monarchy. The regular army is very large, consisting of 880,000 officers and men. The navy comprises 327 vessels, mounting 1812 guns. The capital is St. Petersburg, on the Neva. Other leading cities are Warsaw, Moscow, Riga, Kharkov, and Odessa.

The Eastern Slavs settled near the sources of the Dniester, Don, and other rivers, Novgorod and Kieff being their chief towns. In 862, at their invitation the Norman Rurik came and took possession of Novgorod; Olga, widow and successor of Rurik's son, was baptized 955. A pagan reign followed, but Vladimir, 980–1015, accepted Christianity 988, and did much to extend and civilize his empire, afterward divided and subdivided among his descendants. A Mongol invasion took place 1222, and Batu Khan conquered R. 1235, destroying Moscow, invaded the southwest 1240, destroyed Kieff, and founded the Khanate of Kiptchak; civilization was arrested, and R. thrown 200 years behind the rest of Europe. The growth of Lithuania, annexed to Poland 1569, was favored by the prostration of other parts of R. Dmitri in e. R., 1358–89, obtained a vic-

Arrival at Siberian Post-House.

tory over the Khan 1380. The Tartars afterward twice invaded R., but under Ivan III., 1462–1505, their yoke was shaken off and the empire consolidated. During the minority of Ivan the Terrible, 1533–84, factions prevailed, but from 1547 to the death of his queen Anastasia Romanoff he administered the government with great success; he afterward became suspicious and cruel. The dynasty of Rurik ended 1598 with his son Teodor, whose brother Dmitri was murdered. Pretenders to this name arose; confusion reigned; the King of Poland invaded R., and the land was overrun by Tartars, Poles, and robber-gangs. Michael Feodorovitch Romanoff, 1612–45, being chosen Czar, soon forced the country from foreigners, and summoned a council of representatives to aid the restoration of order. Under Alexei, 1645–76, a new code was drawn up; the right of direct appeal to the Czar was granted; Little R., Smolensk, and most of White R. were added to the empire. The reign of PETER THE GREAT (q.v.), 1689–1725, was of great importance. He subjected himself and others to severe discipline to attain proficiency in the arts he sought to introduce. Much was lost under the weak rule of his successors. Peter III. was dethroned by his wife Catharine II., 1762–96, who largely extended the empire, now divided into governments. Alexander I., 1801–25, shared actively in European affairs and in the overthrow of Napoleon. Nicholas II., 1825–55, carried on war with Persia and Turkey, extending his dominions, and gaining free navigation of the Black Sea, Dardanelles, and Danube; but R. lost much of this by the Crimean War. Alexander II., 1855–81, abolished serfdom and other abuses. Poland was incorporated 1868, and the Caucasus conquered; war with Turkey was again declared 1877, in defense of the rights of Slavonic Christians, and ended by the independence of Roumania, the freedom of Bulgaria under Turkish suzerainty, and the enlargement of Servia; the new State of Eastern Roumelia was formed from Bulgaria. The succeeding period has been marked by the growth of nihilism, which led to the assassination of Alexander II. 1881. Alexander III., 1881–94, pursued a pacific policy, and fostered the national spirit. Anti-Semitic outbreaks characterized the beginning and the later years of his reign. His son, Nicholas II., succeeded.

Russian Backgammon. Game in which the men are not set on the board at the opening of the game, but are entered by both players, who move in the same direction on the same table. When doublets are thrown, the numbers on the opposite sides of the dice are also played, and the player has another throw.

Russian Language. Chief Slavonic language, with two branches, Russian proper and Ruthenian. Its records date from the 11th century, and the literature is growing in importance. There are three dialects, Little, White, and Great Russian, the last being the official and literary language and that of a large majority of the population and which can be understood by all. The alphabet is credited to St. Cyril and St. Methodius of the 9th century, the Greek alphabet with some additions, now used in devotional books. That now in use is the Cyrilian, with some omissions, introduced by Peter the Great; it consists of 36 letters.

Russian Leather. See LEATHER.

Russian Literature. This really began with the reign of Peter the Great, although the Old Church Slavonic, into which Cyril and Methodius translated the Scriptures when they Christianized the western Slavic tribes, contains a number of authors, the most important being the Chronicle of Nestor (11th cent.), the Chronicles of Novgorod, Moscow, Tver, etc., and several lives. The Tartar invasion blotted out all literary ambition and the universal ignorance soon made it impossible. The *Zadonchina*, an epic poem, and the *Domostroi, or Housekeeper's Manual*, from the time of Ivan the Terrible, are extant, the latter by the monk Sylvester. Peter the Great encouraged literature, and the theologian and economist Pososhkov, 1670–1726, the satirist poet Prince Antiokh Kantemir, and the first historian of Russia, Vasisli Tatistchev, belong to his reign. Trediaskovski, 1703–1769, was a translator; Lemonosov, 1711–1765, exerted great influence upon the form of the language and changed the syllabic prosody to the tonic system now used. Other poets were Sumarokov, 1718–1777; Khiazhnin, 1742–1791; and Kheraskov. 1733–1801. Karamzin, under Catharine II., wrote *Letters of a Traveler* and a *Russian History*. The Romantic school was founded by Alexander Pushkin, 1799–1838, and Zhukovskii, 1783–1852, and comprised Kozlov, Batiushkov, the poet Ryleev, Lermontov, Polevoi, and others, ending with Tiuchev, Koltsov, and Krylov, the latter's fables being famous. The Realistic writers begin with Gogol, 1809–1852, and comprise many novelists, the most noted being Alexander Hertzen, Tourgenief. 1818–1883; Dostoevskii, 1822–1881; Count Lev Tolstoi, b. 1828; to which we must add the lesser writers, Goncharov, Pisemskii, Pisarev, Vasilii Krestovskii, Potekhin, Sologub and Gleb Aspendii. The satirist Soltykov, the Nihilist Chernyshevskii, Garshin, and Korolenko deserve mention. Other writers of the later period are Maikov, Khomiakov, Nekrasov, Shenshin, Polonskii, Mei, Nikitin, Stcherbina, Plestcheev, and the Grand Duke Konstantin, whose poetry is admired. Several of the above have won fame as dramatists, with whom we must mention Aleksei Tolstoï. The most celebrated historians are Karamzin, Soloviev, and Kostomarov.

Russian Music. Until the very recent advent of the School of Young Russian Composers, the characteristics of Russian national music found only sporadic expression outside of the ancient melodies, preserved in the Breviary and the people's songs. Early church music was largely borrowed from Greek and Bulgarian sources. Until ab.1700 it remained unisonal. With the cultivation of artistic music in the theater under Peter the Great 1703–25 and his immediate successors, the Italian influence became dominant, and it was deemed necessary to command the use of the ancient melodies. The present style, which contains features of wonderful impressiveness, despite the fact that it is exclusively vocal, came in with BARTNANSKY (q.v.). During the 18th century foreign influences also dominated concert and opera, singers, conductors and composers who worked for the national institutions in St. Petersburg being chiefly Italians and Frenchmen, as Galuppi, Traetta, Sarti, Cimarosa, Boieldieu, and Martini. Sarti set the fashion of composing to words, and C. Cavos wrote 14 operas with Russian texts and subjects. The first distinctively national tendency manifested itself in the operas of VERSTOVSKI and GLINKA (q.v.); the latter's *Life for the Czar* won almost universal recognition. Since then distinguished operatic composers have been Lwoff, A. Rubinstein, Cui, Dargomyzski, and Rimski-Korsakow. The Young Russian School is now represented by the last three of these and Borodin. According to Cesar Cui, the foundation stones on which it has been reared are these: 1. Aside from the words, all dramatic music must have value per se, as absolute music. 2. Music written for words must reflect the spirit of the poem. 3. Every composition must reflect characteristic traits. The last element is obtained by copious borrowing and imitation of the characteristics of Russian folk song.

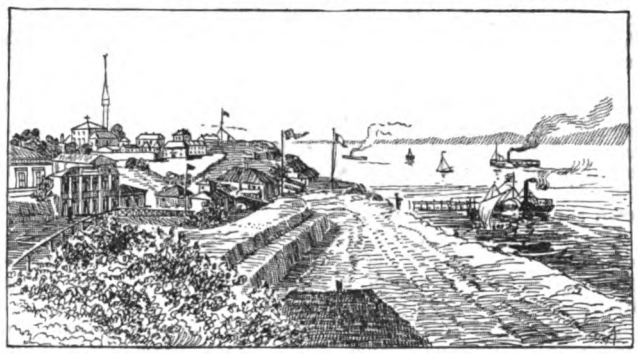
Russium. One of the doubtful elements; discovered 1889 accompanying thorium in monacite.

Russo-Greek Church. Number of adherents in 1892, 73,000,000. See GREEK CHURCH.

Russo-Turkish War. 1877–78; occasioned by massacres in Bulgaria; ended by the fall of Plevna, Dec. 10, after a long siege and severe conflicts. Russia was robbed of the fruits of her victory by the treaty of Berlin, July 13, 1878.

Rustam. Chief of Persian mythical heroes; celebrated by Firdausi. His duel with his son Sokrat has been sung by Matthew Arnold.

Rustchuk. Town of Bulgaria, on the Danube; taken by the Russians after a siege 1810, and held till 1812; besieged



Rustchuk.

again by the Russians 1877–78. It forms one angle of the Turkish Quadrilateral. Pop., 1893, 28,121.

Rustem Pasha, d. 1895. Turkish Ambassador to Italy, Russia, and from 1885 to England.

Rustic Work. Masonry wherein the faces of the stones are left rough, the sides where the union takes place being only wrought smooth.

Rüstow, WILHELM, 1821–1878. German-Swiss soldier and writer. *Geschichte der Infanterie*, 1857–58; *Strategie und Taktik*, 1872–75.

Rusts. Popular name of the *Uredinaceæ*, a family of parasitic *Fungi* growing on a great number of plants, to which they give a rusty or brown appearance. The number of known species is very large and many of them are highly destructive to cultivated plants. Many of them have two stages in their life history, one being produced on one plant, the other on a different species, as the wheat rust, which lives during one stage on wheat and other grasses, and during the other on the barberry.

Rust University. At Holly Springs, Miss.; opened 1868; controlled by Methodists. It has 15 instructors and ab. 320 students.

Rut. Breeding time or period of heat of animals, especially of Mammals. This is usually in spring, but in Ruminants at the close of summer, and in Swine and Carnivores in winter. The time of its occurrence is determined by the length of the period of gestation, so that the birth of the young shall occur at the most advantageous season.

Rutabaga. See TURNIP, SWEDE.

Rutaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 100 genera and ab. 900 species, distributed throughout the temperate and warmer parts of the earth; most numerous in Australia and in s. Africa; called the Rue family.

Rutebeuf, d. ab.1280. French poet, strongest in lyrics and satires.

Ruten. Semitic Palestinian people with whom the Egyptians waged war under the 18th and 19th dynasties.

Rutgers College. At New Brunswick, N. J.; chartered as Queen's Coll. 1766, to prepare for the Reformed Dutch Ministry; twice suspended; reopened 1825. The Scientific School was opened 1863; the State Agricultural Coll. was located here 1864. Teaching staff, 27; students 182, 131 of whom are in science; library, 33,560 vols.

Ruth. 8th O. T. book, of uncertain authorship and date; an idyll of the fortunes of a young Moabite widow, great-grandmother of David.

Ruthenian Rite. Branch of the R. C. Ch., who as a rule speak the Russniak language. They are mostly the United Greeks of Austria-Hungary and Poland, numbering ab. 2,655,000.

Ruthenians. Slavic peasants, numbering ab. 3,000,000 in Galicia and 400,000 in n.e. Hungary. They have a language

and literature of their own, were long subject to Poland, and are mostly of the United Greek Ch., under papal rule.

Ruthenium. Ru. At. wt. 101.6, sp. gr. 12.2, sp. ht. .061, mpt. 2,000° C., valence II.–VIII.; discovered by Claus 1845. It occurs in platinum ore, in osmiridium, and in laurite, Ru_2S_3, and is obtained from the residue left after treating platinum ore with aqua regia. It is insoluble in acids, and but slightly soluble in aqua regia. Heated with potassium hydroxide and niter, it forms potassium ruthenite, K_2RuO_4. It forms six oxides, RuO, Ru_2O_3, RuO_2, RuO_3, Ru_2O_7, and RuO_4. All are rare.

Ruthenium Chlorides. Dichloride. $RuCl_2$. Black crystalline powder, completely insoluble in acids; made by treating the pulverized metal with chlorine at a low heat.—Sesquichloride. Ru_2Cl_6. Brownish-yellow crystalline substance; made by dissolving the sesquioxide in hydrochloric acid.—Tetrachloride. $RuCl_4$. Reddish-brown salt; made by dissolving the hydroxide in hydrochloric acid.

Ruthenium Oxides. Monoxide. RuO. Gray-black powder, soluble in alkalies with bluish-green color; made by treating the corresponding chloride with sodium carbonate.—Sesquioxide. Ru_2O_3. Bluish-black powder; obtained by heating the metal strongly in the air.—Dioxide. RuO_2. Made by treating the sulphate with caustic potash.—Tetroxide. RuO_4. Made from the dioxide by heating to 1,000° C.

Ruthenium Sesquiiodide. Ru_2I_6. Only compound of ruthenium and iodine; black substance, made by adding potassium iodide to the double chloride of potassium and ruthenium.

Ruthenium Sulphate. $Ru(SO_4)_2$. Orange-yellow, deliquescent, soluble substance, made by treating the sulphide with nitric acid.

Ruthenium Sulphide. This occurs naturally in Laurite, Ru_2S_3.

Rutherford, SAMUEL, ab.1600–1661. Scottish divine, prof. St. Andrews 1639-60. His *Lex Rex*, 1644, was burned by the hangman 1660. Several of his books have been reprinted, notably his *Letters*, 1664.

Rutherfurd, LEWIS MORRIS, 1816–1892. American pioneer in astronomical photography and spectrum analysis. His results were in great part achieved with instruments of his own construction.

Rutile. TiO_2. Brownish-red to black mineral of peculiar metallic adamantine luster, consisting essentially of titanium and oxygen. It has been found associated with many kinds of the older crystalline rocks, and with limestone. It is often present in transparent quartz in the form of slender, needle-like crystals.

Rutilius Claudius Numatianus. 4th cent. Latin poet of Gaul. His description of a journey from Rome is still in part extant.

Rutimeyer, LUDWIG, b. 1825. Prof. Basel 1855: writer on geology and zoölogy.

Rutland. Capital of R. co., Vt., on Otter Creek, 67 m. s. of Burlington; settled 1770; noted for its marble quarries. Pop., 1890, 11,760.

Rutledge, JOHN, 1739–1800. Delegate to Congress 1774–75 and 1782–83; Pres. of S. C. 1776–78; Gov. 1779–82; Chancellor 1784; member Constitutional Convention 1788; Chief-justice of S. C. 1790–95, and of U. S. Supreme Court July–Nov. 1795.—His brother, EDWARD, 1749–1800, was in Congress 1774–77, signed the Declaration of Independence, rendered other public services, was a prisoner in Fla. 1780–81, and Gov. of S. C. from 1798.

Rütli, or GRÜTLI. Field near Lake Lucerne, where men of Uri, Schwz, and Unterwalden swore 1307 to resist and overthrow the Austrians.

Rutuli. Tribe of Latium, early subdued by Romans.

Ruysbroek, JOHN, 1293–1381. Flemish mystic, monk of Groenendael 1353. His works were pub. in Latin 1552 and in German 1701.

Ruysch, RACHEL, 1664–1750. Dutch fruit and flower painter.

Ruysdael, JACOB. See RUISDAEL.

Ruyter, MICHAEL ADRIANSZOON VAN, 1607–1676. Dutch Rear-admiral 1645; famous chiefly in the wars with England. In 1667 he sailed up the Thames, destroyed many vessels, and brought about the peace of Breda.

Ryan, ABRAM JOSEPH, 1839–1886. R.C. pastor at Mobile, popular in the South as a lyric poet. *Poems*, 1880.

Ryan, HARRIS JOSEPH, b. 1866. Prof. Cornell 1889; writer on electricity.

Ryan, PATRICK JOHN, D.D., b. 1831 in Ireland. Coadjutor bp. of St. Louis 1872; Abp. of Phila. 1884.

Ryan, SAMUEL ERWIN, 1831–1891. Irish-American actor.

Ryan, STEPHEN VINCENT, D.D., 1825–1896. R. C. Bp. of Buffalo 1868.

Rydberg, ABRAHAM VICTOR, 1829–1895. Swedish author and journalist. *The last Athenian*, 1859; *Roman Days*, 1877; *Teutonic Mythology*, 1886, tr. 1889.

Ryder, ALBERT PINKHAM, b. 1847. American painter, active in New York; equally at home with animals, landscapes, and figures.

Ryder, JOHN ADAMS, 1852–1895. American naturalist. Prof. of Biology, Univ. Penna., 1886.

Rydquist, JOHAN ERIK, 1800–1878. Swedish grammarian.

Rye. Seaport and market town of England, 10 m. n.e. of Hastings. R. was a Cinque port, the Ypres tower being a sur-

Rye from the South.

vival of the ancient fortifications. It also has remains of its ancient walls and gates. Exports wool, timber, and hops. Pop., 1891, 4,521.

Rye. *Secale cereale.* Annual grass, supposed to be native of Asia, but unknown in the wild state; cultivated from prehistoric times for its grain. It is grown as a winter crop in localities where the soil is too poor or the climate too unfavorable for winter wheat. In the vicinity of large cities the straw is the most important part of the crop, and is kept straight in threshing, in machines specially built for the purpose. The production of rye in U. S. in 1895 was 27,210,000 bushels.

Rye-Grass. See DARNEL.

Rye House Plot. Scheme of English Whigs to assassinate Charles II. when on his way from Newmarket to London, and seat the Duke of Monmouth on the throne; discovered 1683. Russell and Sydney were executed for alleged complicity in it; Monmouth fled over sea.

Ryland, JOHN, D.D., 1753–1825. English hymnist; pres. Baptist Coll. at Bristol from 1794.

Ryle, JOHN CHARLES, D.D., b. 1816. Bp. of Liverpool 1880. *Expository Thoughts on the Gospels*, 7 vols., 1856–69; *Christian Leaders*, 1869.

Ryleev, or **Relaieff,** KONDRATI FEDOROVICH, 1796–1826. Russian poet, executed for treason. *Works*, 1872, tr. 1887.

Rymer, THOMAS, 1640–1713. English critic and collector of materials for history. *Fœdera*, 20 vols., 1704–35.

Rysbrach, MICHAEL, 1693–1770. Flemish-English sculptor.

Ryswick, PEACE OF. Concluded Sept. 20, 1697, near the Hague, between France and England and her Allies.

S

Saadi. See SADI.

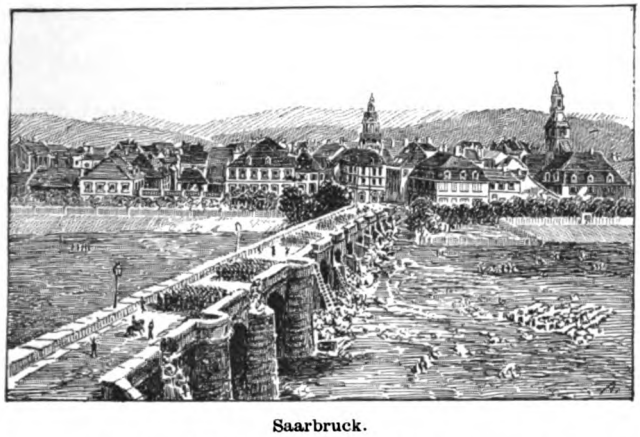
Saadja ben Joseph, 892–942. Egyptian Jew, teaching at Sura in Babylonia from 928; commentator and author, writing in Arabic. His *Religions and Dogmas* was tr. into Hebrew 1186, and into German 1845. His works were edited at Paris 1893 and later.

Saale. River rising in n.e. Bavaria and flowing n. to the Elbe. Length 225 m.; navigable for 100 m.

Saalfeld. Town of Saxe-Meiningen, on the Saale; scene of a French victory over Prussians, Oct. 10, 1806. Pop., 1890, 9,801.

Saar. River flowing from its source in France, through Alsace-Lorraine and Rhenish Prussia, ab. 120 m., into the Moselle near Treves.

Saarbrück. Town of Rhenish Prussia, on the Saar; taken by the French Aug. 2, 1870; retaken Aug. 6 by the Germans,



Saarbruck.

after the battle of Forbach. The mitrailleuse was first employed here Aug. 2. It is the center of a large coal-field, and has manufactures of iron, tobacco, glass and chemicals. Pop., 1890, 13,812.

Saavedra, ANGEL DE, DUKE DE RIVAS, 1791–1865. Spanish poet, dramatist, and historian, in exile 1823–34 and 1837–43; Envoy to Naples 1843–48.

Sabæans. People of s.w. Arabia, repeatedly mentioned in O. T.; long independent and commercially important till near our era.

Sabaka. Conqueror of Egypt ab.700 B.C., and founder of its 25th dynasty.

Sabatier, PAUL, b. 1858. French Protestant, pastor at Strassburg 1885–89, and since in the Cevennes. His *Life of St. Francis of Assisi*, begun 1883, was pub. 1894, and crowned by the Academy.

Sabbatarians. Christians who hold themselves bound to observe the seventh day as the Sabbath; sometimes, all strict observers of a Sabbath.

Sabbath. Seventh day of the week, ordained, in the Ten Commandments, to be kept sacred from labor. Gentile Christians have commonly transferred more or less of the sabbatical obligation to the first day, which the Apostles celebrated as that of the Resurrection.

Sabbathai Zevi, or TSEVI, 1641–ab.1677. Jew of Smyrna, accepted by many as Messiah; imprisoned and forced to recant by the Sultan 1667.

Sabbatical Festivals. (1) 7th day; (2) 7th month, Tisri or October; (3) 7th year: see YEAR OF RELEASE; (4) 50th year, or Jubilee.

Sabella. Tubicolous Annelid worm, with body thick anteriorly, tapering to the tail. The tentacles are gathered in two groups. There is a lip above the mouth. Like *Serpula*, it secretes material which forms a crooked tube, within which the worm lives, fastened upon a shell or rock.

Sabellianism. Doctrine that God in Himself is unipersonal, but is revealed successively as Father, Son, and Spirit; named from Sabellius, an African presbyter, excommunicated at Rome ab.218 and at Alexandria 260.

Saber. Military hand arm used for cutting, or for both cutting and thrusting. The light artillery saber, used for cutting, has a short curved blade and a comparatively light hilt, to throw the center of gravity well forward. The cavalry saber for cutting and thrusting has a longer and straighter blade, and a heavier hilt, to bring the center of gravity nearer the grasp and to better protect the hand.

Sabiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 4 genera and ab. 40 species, growing in the tropics and countries bordering thereon, especially in the n. hemisphere.

Sabine, SIR EDWARD, D.C.L., F.R.S., 1788–1883. Irish officer and physicist; Major-gen. 1856; knighted 1869. *Figure of the Earth*, 1825; *Variability of Magnetism*, 1838.

Sabine, LORENZO, 1803–1877. M.C. 1852–53; Sec. Boston Board of Trade. *American Loyalists*, 1847; *Fisheries*, 1853; *Duels*, 1855.

Sabine Cross Roads. Near Mansfield, La.; scene of a Union defeat April 8, 1864.

Sabine Pass. Mouth of S. river and lake. It has been improved by jetties and dredging.

Sabine River. In e. Texas, whence it flows s.e. and s., forming part of the La. boundary, to its mouth in Sabine Lake. Drainage area 20,440 sq. m., length ab.500 m.

Sabines. Ancient and powerful people of central Italy, sub-divided into many tribes; the last were subdued by Rome 290 B.C. See SAMNIUM.

Sabinianus. Pope 604–606.

Sabinus, MASURIUS, 1st cent. Roman jurist, whose important work on Civil Law is lost.

Sabism. Mixture of Christianity and star-worship, early prevalent in parts of w. Asia.

Sable. The American Sable or Pine Marten (*Mustela americana*) is closely related to the true Siberian Sable, *M.*

Sable (*Mustela zibellina*).

zibellina, which furnishes the beautiful black fur, worth $200 per skin, owing to the danger of trapping during the severe winter. The former is of the size of a cat, but with shorter

legs and bushy tail. The fur is dense, soft, and dark brown, the paws are black. It lives in the great virgin forests of Canada, nesting preferably in hollow trees near water. Though persistently trapped, it appears to hold its own. It is prolific, bearing 7 young at a time. *M. martes* is the yellow-breasted Marten of n. Europe. See MUSTELIDÆ.

Sable, CAPE. S. point of Fla.

Sable Island. Ab. 110 m. e. of Nova Scotia; colonized 1598–1603; sinking or dwindling in area, and dangerous to navigation.

Sabot. Thick wooden disk used in heavy smooth-bore guns to separate the cartridge from the projectile. It keeps the spherical projectile in place, reduces the windage, and diminishes the effects of balloting. In firing over troops its fragments are dangerous.

Sabots. Wooden shoes used by peasants in France and Belgium.

Sabrina. 1. Section of Antarctic coast. 2. Volcanic islet of the Azores, visible 1811–ab.1840.

Sabulose. Plants growing naturally in sandy soil.

Sac. In Botany and Zoölogy, closed or nearly closed cavities.

Sacaline. Forage plant introduced into the U. S. 1894 from the Russian island of Saghalin in the Pacific Ocean. It is a woody herb growing from 6 to 12 ft. high, and is said to resist severe drought.

Saccardo, PIETRO ANDREA, b. 1845. Prof. Padua; writer on *Fungi.*

Saccatæ. See CYDIPPIDÆ.

Saccharic Acid. $C_4H_4(OH)_4(COOH)_2$. Dibasic acid, isomeric with mucic acid; produced by the oxidation of cane sugar and glucose with nitric acid; oil, solidifying slowly when anhydrous; used in calico printing.

Saccharimeter. See HYDROMETER.

Saccharin. (a) $C_7H_5SO_3$. Orthobenzoylsulphoneimide; mpt. 220° C. This white substance possesses remarkable saccharine powers, being, when pure, 500 times sweeter than sugar. It is prepared from the tolueneorthosulphonic acid by the oxidation of the amide of this acid. It is used in pharmacy and for sweetening foods, and is called Fahlberg's saccharin. (b) $C_6H_{10}O_5$. Carbohydrate of the same composition as starch.

Saccharoidal. Crystalline, heavy-headed marble, so called as resembling white sugar.

Saccharomycetes. Class of the *Protophyta*, including yeast and other ferments whose propagation is mainly by gemmation. By some authors they are regarded as *Fungi* of the sub-class *Ascomycetes*, of which they may form the most degraded member.

Saccharose. See CANE SUGAR.

Sacchetti, FRANCO, ab.1335–1399. Florentine writer in Boccaccio's manner. His *Novelle* were collected 1724.

Sacchini, ANTONIO MARIA GASPARO, 1734–1786. Italian composer of ab.60 operas. All have disappeared from the stage and many are lost. *Semiramide*, 1762.

Saccoglossa. Sub-order of opisthobranchiate univalve Mollusks, including forms having no gills, but which may have, instead, simple dorsal appendages. The radula has one row of toothed, plates, of which the anterior, after they wear out, fall into a special pocket. *Limapontia* and *Elysia* are included. The group is sometimes placed as a sub-group under *Nudibranchiata.*

Saccule. Little expansion of the internal ear, connected with the cochlea by the canalis reuniens, and with the utricle by the aquæ ductus vestibuli.

Sacerdos, MARIUS PLOTIUS, 3d cent. Latin writer on grammar.

Sachau, KARL EDUARD, b. 1845. Prof. Vienna 1872, Berlin 1876; writer on Oriental philology.

Sacher-Masoch, LEOPOLD, 1834–1895. Polish-Austrian novelist. *Cain's Inheritance.*

Sacheverell, HENRY, D.D., 1672–1724. Tory orator, impeached 1710 for violent political sermons, and suspended till 1713; rector in London from 1714.

Sachs, BERNARD, M.D., b. 1858. Prof. New York 1888; writer on nervous diseases and insanity.

Sachs, HANS, 1494–1576. Shoemaker and poet of Nuremberg, author of 6,048 larger or smaller pieces, songs, dramas, stories, fables, and histories. He was the chief literary figure of his time in Germany after Luther, and did much to promote the Reformation. His works, or most of them, have survived temporary oblivion, and were collected in 15 vols. 1886.

Hans Sachs.

Sachs, JULIUS, b. 1832. Prof. of Botany at Bonn 1861, and Würzburg 1868. *Handbuch der Experimental-Physiologie der Pflanzen*, 1866; *Lehrbuch der Botanik*, 1870.

Sack. Wine much used in England ab.1600; probably akin to sherry and Madeira.

Sackbut. Ancient musical instrument, allied to the trumpet.

Sackett's Harbor. Village of Jefferson co., N. Y., 8 m. e. of Lake Ontario; naval station 1812–15. Pop., 1890, 787.

Sackville, GEORGE GERMAIN, LORD, 1716–1785. Lieut.-gen. 1758; M.P. 1761; Colonial Sec. 1775–82; Viscount 1782.

Sackville, LIONEL WEST, BARON, b.1827. British Minister to U. S. 1881–88.

Sackville, THOMAS, 1536–1608. Dramatist; made Lord Buckhurst 1566. Lord Treasurer 1599; Earl of Dorset 1604; author, with T. Norton, of *Gorboduc, or Ferrex and Porrex*, 1562, the first English tragedy. *Induction* to Wm. Baldwin's *Mirror for Magistrates*, 1563.—His descendant, CHARLES, 6th earl, 1637–1706, wrote songs.

Saco, JOSÉ ANTONIO, 1797–1879. Cuban historian of slavery, 1876 and later.

Saco River. In N. H. and Me., rising in the White Mts. and flowing s.e. to the Atlantic. Length 165 m.

Sacrament. Religious rite, of especial dignity and importance, instituted by our Lord. Protestants admit two, Baptism and the Lord's Supper; Roman Catholics and Greeks five more, Confirmation, Penance, Orders, Extreme Unction, and Matrimony.

Sacramentarians. 1. Zwinglians and others who denied the Real Presence; so called by Lutherans. 2. Sometimes, loosely, in England, those holding high sacramental views.

Sacramento. Capital of Cal. and a city of S. co., on the left bank of S. River, here navigable; founded by J. A. Sutter 1839. Here gold was discovered 1848. Pop., 1890, 26,386, ab. one-third of foreign birth.

Sacramento River. In n. Cal.; with its main branch, the San Joaquin, it drains the valley of Cal. and the western slopes of the Sierra Nevada, and flows into the Bay of San Francisco. Length over 500 m., drainage area 58,824 sq. m., average flow 37,632 cu. ft. per sec. at Sacramento.

Sacred Bean. See NELUMBO.

Sacred Heart. R.C. festival of French origin, made general 1856; based on a vision of a nun who d. 1690 and was beatified 1864. An order of nuns, founded 1800, has spread widely: others are less extended.

Sacred Mount. Elevation 3 m. from Rome, beyond the Arno, to which the Plebs withdrew in their controversy with the Senate.

Sacred Music. See CHANT, CHOIR, CHORALE, MASS, PLAIN SONG, etc.

Sacred Trees. Among primitive people, trees are frequently regarded as the dwelling-place of demons and ancestral and other spirits, and as such become the object of worship

and of offerings. They have been looked upon as the abode of certain gods, and resorted to, as the oracle of Dodona in Epirus, where Zeus was believed to give messages to men through the rustling of the leaves of a lofty oak.

Sacred War. Between Thebes and Bœotia 357-346 B.C.; ended by intervention of Philip.

Sacrifice. Institution of all ancient religions. With the Hebrews it was of several kinds, chiefly burnt-offerings and sin-offerings: all were propitiatory, and symbolical of the supreme sacrifice of Christ, as explained in the Epistle to the Hebrews. Human sacrifices were common among pagans, as with Phœnicians, Druids, and Aztecs.

Sacrilege. Violation of sacred things or places: punishable among Jews, capitally under Roman law, and in various degrees in Christian countries; now obsolete.

Sacristy, or VESTRY. Room in which ch. vessels and vestments are kept; formerly in care of a sacristan, whence the

Ancient Sacristy—Scuola della Misericordia, Venice, by Palladio.

word sexton. It is within the walls of the church or an Adjunct. In England it is called a Vestry.

Sacrobosco, or **Holywood,** JOHN, d. ab.1250. English mathematician, teaching at Paris. His *De Sphæra Mundi*, from an Arabic version of Ptolemy's *Almagest*, was pub. 1472 and often later.

Sacrum. Next to the last bone of the spinal column. It is wedge-shaped with its base up, inserted between the hipbones, forming, with the coccyx, the posterior wall of the pelvis.

Sacs AND **Foxes** (SAUKS and OUTAGAMIES). Branch of the Shawnees with the Kickapoos; originally discovered in the territory from Green Bay s. They number ab.1,200. Those in Iowa are farmers; those on reservations in Indian Territory are less civilized. Black Hawk, a Pottawatomie by birth, was chief of the Sacs and Foxes. They ceded their lands e. of the Mississippi to U. S. 1804.

Sacy, ANTOINE ISAAC, BARON SILVESTRE DE, 1758–1838. Great French investigator in Arabic and Persian; prof. Paris 1815; Baron 1813, Peer 1832. *Grammaire Arabe*, 1810.—His son, SAMUEL USTAZADE. 1801–1879. journalist, became an Academician 1855, and a Senator 1867. *Variétés*, 1858.

Sacy, LOUIS ISAAC LE MAISTRE DE, 1613–1684. French priest, nephew of the abbess Angélique; confessor of the Port Royal nuns; translator of the Bible 1667–72.

Saddle. Top of a convex fold in geological strata or in ore deposits; if the top has been removed by erosion, the lost portion is called an air saddle.

Saddle. Saddle-shaped casting placed upon the top of a tower of a suspension bridge to support the cables. It also allows a slight degree of motion, which prevents the horizontal pull of the cable from taking effect on the tower.

Saddle and Saddlery. The harness of horses, mules, etc. In U. S. domestic steer hides, tanned with bark, are used for harness; russet skirting is bleached after scouring. A saddle is a seat for the rider on the back of a horse. The Roman cavalry had beautiful coverings on their horses, as did the Persians. The saddle was invented ab. 350; stirrups were added in the 6th century. The English saddles of the 13th century were similar to those now used and the women sat sidewise. The saddles of the cavaliers had high peaks before and behind, like those of the present Spaniards and Mexicans, and the holsters for pistols were fastened to the pommel. The McClellan saddle of the U. S. cavalry is a modification of this. A saddle consists of the wooden saddle-tree, padded under flaps, upper flaps, seat, belly-band, stirrups and straps, and the crupper-loop. For hilly regions a breast strap is added. This is the English saddle. The McClellan saddle has no padding and is covered with rawhide. The side saddle for women originated in England in 1380, the present form with the third pommel in 1830. See HARNESS.

Saddle-Bars. Iron bars to which the lead panels are fastened in the glazing of church windows.

Sadducees. Aristocrats of later Judaism; few, but of high rank, wealthy and worldly. They adhered to the letter of Scripture, denied tradition and the life to come, asserting that the hope of it deadened the energy of patriotism; they maintained Free Will, as against the Predestinarianism of the Pharisees.

Sade, DONATIEN ALPHONSE, MARQUIS DE, 1740–1814. French novelist of the fleshly school.

Sadebeck, ALEXANDER, 1843–1879. Prof. Kiel; writer on mineralogy. *Angewandte Krystallographie*, 1876, tr. as vol. ii. of Rose's *Elements of Crystallography*.

Sadi, or SAADI (MUSLIH-UDDIN), ab.1184–1291. Persian lyric and didactic poet of great fame. Next to his *Gulistan*, or *Rose-garden*, is the *Bostan* and *Pend-Nameh*.

Sadler, SIR RALPH, 1507–1587. Thrice Envoy to Scotland; knighted 1547; Privy Councilor under Edward VI. and Elizabeth; jailer of Mary Stuart at Tutbury 1562. *Letters*, 1720, repub. 1809.

Sadlier, MARY ANNE (MADDEN), b. 1820. Irish-American R. C. novelist.

Sadoleto, JACOPO, 1477–1547. Secretary to 3 popes; Bp. of Carpentras 1517, Cardinal 1536; correspondent of several reformers; author of commentaries, letters, and books of philosophy. His works were collected 1737 and 1759.

Sadowa, or **Königgrätz,** BATTLE OF. In Bohemia; decisive Prussian victory, July 3, 1866, over the Austrians under Benedek, who lost 40,000 men. This gave the supremacy to Prussia, unity to N. Germany, Venetia to Italy, and legislative independence to Hungary.

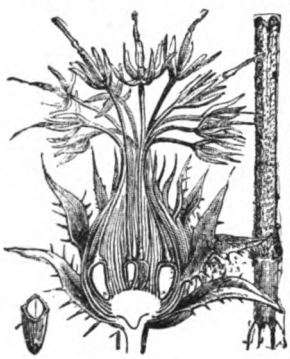
Safe. Strong case for containing money, account-books and other valuables, provided with means to protect them from fire and burglars. See FIREPROOF SAFES and LOCK.

Safed. Town 6 m. n.w. of Sea of Galilee; site of a castle built by Crusaders 1140 and by Templars 1240; destroyed by Mohammedans 1220 and 1266; colonized by Jews in 16th century.

Safety Lamp. Lamp for use in mines, especially coal mines, where gases are liable to rise which form explosive mixtures with air. The lamp is so constructed as to hinder the flame from coming in contact with the explosive mixtures surrounding it, though the presence of a dangerous gas is often indicated by changes in the character of the flame in the interior of the lamp. The first efficient lamps of this type were invented almost simultaneously in England 1815, by George Stephenson and Sir H. Davy, the principle being that an ordinary lamp flame will not pass through the meshes of wire gauze, provided the gauze be kept from becoming too highly heated. In the lamp invented by Dr. Clanny 1814, an attempt was made to protect the flame by means of a globe of water, but the contrivance was too cumbrous for general adoption. The earlier forms of lamps have been modified many times and in many ways by different inventors, with a view to remedying defects in construction and to increasing the efficiency of the protection afforded in cases of exceptional danger. A large number of patterns are now used in different parts of the world.

Safety-Valve. Valve on a vessel in which there is pressure, which is held shut by such a force only that the valve will be pressed open for the release of pressure when that pressure exceeds a certain amount. There are four types: 1. Direct load of the valve by a weight. This is limited to relatively small pressures, and is inconvenient always. 2. Weight indirectly bearing on a lever to keep the valve shut. This is the most usual form, and has the advantage and disadvantage of allowing the amount of pressure to be easily varied: spindles may bind to prevent the valve from moving. 3. Direct pressure by a spring; much used in newer practice, and in the form of pop-valve universal on locomotives; compact and light, not easily tampered with. When the reaction groove is cut in its face, so that when once lifted a larger area is opened to the escape of steam and the valve is held up as by a less pressure, the objection is removed to the small opening which the increasing resistance of the spring would cause as the ordinary valve lifts. 4. Indirect loading by a spring through a lever. This is least used now, though once the standard locomotive method. Safety valves for steam boilers are usually misnomers, as in most cases they would not carry off all the steam which the boiler would make. The area of the orifice should be sufficient for this, even when the valve lifts but a very small distance under high pressure. This valve was invented by Denis Papin for his digester, ab.1680.

Safflower. *Carthamus tinctorius.* Prickly annual herb of the Composite family, native of Europe and Asia; cultivated for its valuable red and yellow dye, which is obtained from the flowers. The safflower colors are very fleeting.


Safflower.

Safford, JAMES MERRILL, M.D., b. 1822. First State Geologist of Tenn. 1854–60 and 1871–95; prof. Vanderbilt Univ. 1875. *Geology of Tenn.*, with map, 1869.

Safford, TRUMAN HENRY, b. 1836. Director Chicago Observatory 1865; prof. Williams Coll. 1876.

Saffranine. Largely $C_{21}H_{21}N_4Cl$. Product of the oxidation of one molecule each of toluylene diamine, aniline, and orthotoluidine, dark powder, soluble in water. It dyes silk and wool pink, and cotton also upon a tannin mordant.

Saffron. *Crocus sativus.* Herb of the natural family *Iridaceæ*, native of s. Europe; cultivated for its yellow stigmas, from which the dye saffron is obtained.

Saffron, MEADOW. See COLCHICUM.

Saffron of Mars. Hydrated sesquioxide of iron with a little undecomposed carbonate, used in medicine.

Sag. Amount of deflection from a horizontal line of a cord, tape, or chain; this is less the lighter the cord and greater the pull upon it. Let W be the weight of the cord, l its length, and P the horizontal pull, then the sag in the middle is Wl divided by 8 P.

Sagar, or SAUGOR. 1. Holy island at mouth of the Hugli, in e. India; annually visited by many pilgrims; scarcely habitable, from frequent destructive floods; area 225 sq. m. 2. Town of central India, on Lake S. Pop., 1891, 44,674.

Sagas. Ancient Scandinavian legends of considerable length, relating historical or mythical events. See SCANDINAVIAN LITERATURE.

Sagasta, PRAXEDES MATEO, b. 1827. Spanish liberal, member of several cabinets from 1868; Prime Minister 1881–83, 1885–90, 1892–95, and 1897.

Sage. Plants of the genus *Salvia*, herbs of the natural family *Labiatæ*, of wide geographical distribution. *S. officinalis*, native of Europe, is the garden sage; many species are cultivated for ornament.

Sage (*Salvia officinalis*).

Sage, JERUSALEM. *Phlomis tuberosa.* Coarse herb of the Mint family, native of Europe, sparingly introduced as a weed into N. America.

Sage, WOOD. See GERMANDER.

Sage, ALAIN RENE. See LESAGE.

Sage, GARDNER AVERY, 1813–1882. Benefactor of New Brunswick (N. J.) Theol. Sem. and other Reformed (Dutch) institutions.

Sage, HENRY WILLIAMS, 1814–1897. Founder of Sage Coll. at Ithaca, N. Y.; benefactor of Cornell Univ.

Sage, RUSSELL, b. 1816. M.C. from N. Y. 1853–57; financier and railway operator.

Sagean, MATHIEU, ab.1655–ab.1710. French-Canadian explorer of the lower Mississippi and some of its w. tributaries. His narrative was tr. 1862.

Sage Bush. Shrubs of the genus *Artemisia*, of the Composite family, with bitter aromatic foliage, natives of w. N. America.

Sage Cock. See GROUSE.

Saghalien, or SAKHALIN. Island off s.e. coast of Siberia, held by China till ab.1800, then by Japan, and since 1875 by Russia. It has relics of prehistoric times, and coal mines worked by convicts, but is unfitted for agriculture. The natives are mostly Ainos. Length 670 m., area ab.29,000 sq. m., pop. ab.12,000.

Saginaw. City of S. co., Mich., on the S. River; settled 1849, chartered 1859, enlarged 1890. Its interests consist mainly of lumber and salt manufacturing. Pop., 1890, 46,322.

Saginaw Bay. Opening from Lake Huron into Mich. It receives S. River, 30 m. long.

Sagitta. Chætognath worm, allied to the Nematodes; small, transparent, cylindrical, with a horizontal fin around the tail, which forms more than half of the body and contains a pair of cavities containing the testes. The dorsal and the ventral mesenteries of the body similarly separate two cavities containing the ovaries. The mouth is provided with bristles that act as toothed jaws.

Sagittal Plane. Median, longitudinal, vertical plane of bilaterally symmetrical animals, or any plane parallel to it.

Sagittarius. See ZODIAC.

Sagittate. Leaves or other organs with arrow-shaped bases.

Sago. Nutritive, farinaceous substance, obtained from the pith of certain species of *Sagus* and *Cycas* in Java and Singapore, by stirring with water, allowing to settle, and rubbing the deposit through sieves. Each tree yields ab. 600 pounds of sago. Graulated sago is prepared by allowing the mixture after passing through the sieve to fall into a heated vessel, so that it is slightly baked. Portland sago is a kind of arrowroot.

Sago Cheese. Name given in the U. S. to SCHNABZIGER CHEESE (q.v.).

Sago-Palm. See CYCAD.

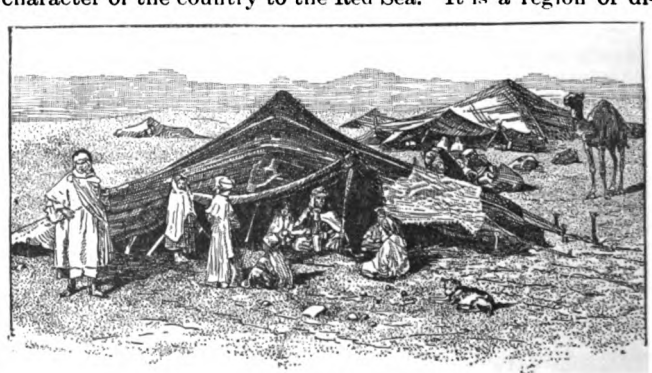
Saguenay. River of Quebec, flowing e. from Lake St. John, tributary to the St. Lawrence; noted for salmon and scenery. Length ab.130 m., drainage area 23,716 sq. m.

Saguntum. Greek city on e. coast of Spain, besieged by Hannibal 219 B.C.; famous for the heroic resistance of its people, who perished with it: hence the 2d Punic war. The Romans rebuilt it, and it is now Murviedro.

Sahagun, BERNARDINO DE, ab.1498–1590. Spanish Franciscan, missionary in Mexico from 1529; historian of the Aztecs and of the Conquest (pub. 1829): author of an Aztec grammar and dictionary 1576–78.

Sahama. Peak of the Andes, in Peru; altitude 22,350 ft.

Sahara. Largest desert region on the earth, in n. Africa. It extends westward to the Atlantic, n. to the Barbary states, s. to the Soudan and e. to Egypt, which maintains the desert character of the country to the Red Sea. It is a region of diversified surface, containing vast plains of sand without vegetation, ranging in elevation from below sea level to 2,000 ft. above it, ranges of mountains, and numerous oases produced by springs and streams. Its area is estimated at 2,500,000 sq. m., its pop. at 1,000,000.


Sahara Landscape—Nomad Encampment.

Saharanpur. Town of n. India, 125 m. n. of Delhi; capital of a British district. Pop., 1891, 63,194.

Sahib. Appellation of Europeans in India.

Sahlite, or SALITE. Variety of pyroxene, named from Sala, in Sweden, where it has been found in characteristic form.

Saigo, TAKAMORI, 1825–1877. Japanese general, Minister of State 1870–73.

Saigon. Capital of French Cochin-China; on the S., 35 m. from the China Sea. It has large exports, especially of rice. Pop., 1890, 16,213, or, with its suburb, Cholon, 56,138.

Sail. Assemblage of several breadths of canvas sewed together by the lists, and edged round with cord, fastened to the yards of a ship to make it drive before the wind. The use of sails is known to date from remote times. See RIGGING.

Sail Cloth. Canvas for sails made of jute, hemp, cotton or flax. In thickness and weight it varies from 22 to 44 lbs. per bolt of 38 yds., 24 in. wide.

Sailor's Creek. In Va.; scene of the capture of Ewell's division, some 8,000 men, by Sheridan, April 6, 1865.

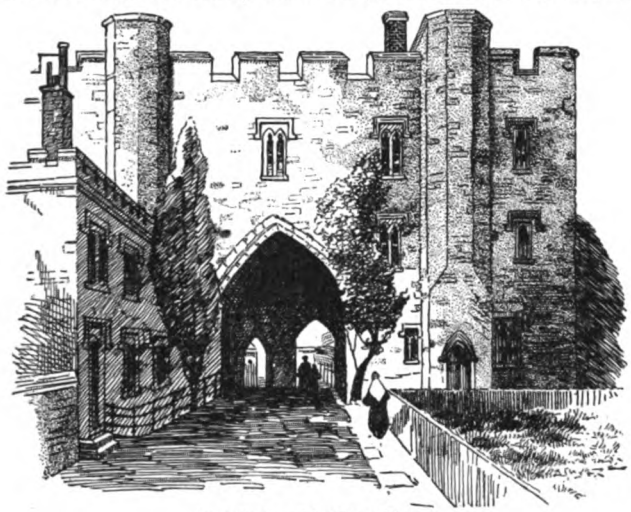
Sainfoin. *Onobrychis sativa.* Leguminous forage plant, resembling clover, but coarser and with larger leaflets. It is more grown in Europe, especially Germany, than in America. Also known as Saintfoin.

Saint. See SAINTS.

St. Alban, d. ab.303. English protomartyr.

St. Albans. Capital of Franklin co., Vt.; raided Oct. 19, 1864, by Confederates from Montreal. A Fenian expedition crossed hence into Canada 1866, but was easily repelled.

St. Albans. City of Hertfordshire, 20 m. n.n.w. of London; scene of two battles. May 22, 1455, the Lancastrians were defeated and Henry VI. made prisoner; Feb. 17, 1461, the



St Albans—The Gate-House

Yorkists under Warwick were totally defeated by Queen Margaret, and the king rescued. The ruins of the Benedictine Abbey, founded 793, rebuilt ab.1100, are of architectural importance.

St. Ambrose. See AMBROSE, ST.

Saint Andrew, ORDER OF. See ANDREW, SAINT, ORDER OF.

St. Andrews. University town in e. Scotland, 42 m. n.e. of Edinburgh. Its abp. was the Primate. The ruins of its cathedral and castle, or bishop's palace, built ab.1160–1200, with other relics, are of historic importance.

St. Andrews, UNIVERSITY OF. Founded 1411; oldest in Scotland. It acquired its 3 colleges before the Reformation: St. Salvator's was founded 1456, St. Leonard's 1512, St. Mary's 1537. Affiliated with it is University Coll., Dundee, opened 1883.

St. Andrew's Cross. *Ascyrum crux-andreæ.* Yellow-flowered herb of the natural family *Hypericaceæ*, native of the s.e. U. S.; named from the form of its flowers, the petals spreading like the arms of a Maltese cross.

St. Anthony's Fire. Erysipelas, a disease probably caused by a micrococcus; probably known in England as *Rose.*

Saint-Arnaud. See LEROY DE SAINT-ARNAUD.

St. Asaph. Town of n. Wales, site of a very old bishopric, with the smallest British cathedral. Pop. ab. 1,900.

Saint-Aubain, ANDREAS NIKOLAI DE (CARL BERNHARD), 1798–1865. Danish novelist.

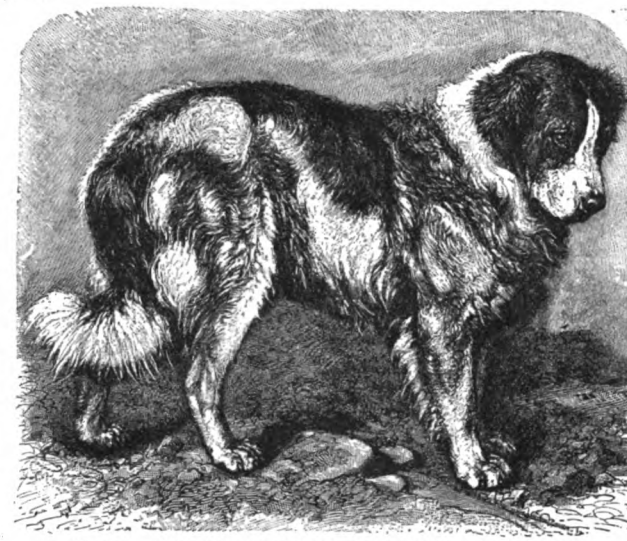
St. Augustine. Capital of St. John's co., Fla.; on Matanzas Inlet; oldest city in the U. S.: founded by Menendez de Aviles 1565; occupied by the British 1762–83; acquired by U. S. 1821. There are many remains of old Spanish forts and buildings. Pop., 1890, 4,742, much increased in winter by Northern visitors.

St. Bartholomew's Day. See BARTHOLOMEW.

St. Bees. Village of Cumberland, former site of a nunnery, and since 1816 of a divinity college.

St. Bernard. See BERNARD, ST.

St. Bernard. Breed of dogs, allied to the mastiff, but resembling the Newfoundland in temper and in his disposition to fetch and carry. Until lately confined to the Alps and adjacent countries, where it is used to recover persons lost in the snowstorms. Wonderful stories are told of its intelli-



St. Bernard Dog (*Canis familiaris extrarius st. bernhardi*).

gence. There are two distinct varieties: the smooth and rough coated.

St. Bernard, LITTLE. Alpine pass on the frontier of Savoy and Piedmont, Italy, s. of Mont Blanc. Hannibal is supposed to have crossed it in his invasion of Italy. Height 7,170 ft.

St. Brandan, or BRENDAN, ab.600. Irish monk, hero of legendary voyages; celebrated by Matthew Arnold.

St. Brandan's Isle. Imaginary island in the Atlantic, found on maps of 15th century; supposed retreat of King Roderick of Spain. The legend was current in the time of Columbus and after.

St. Bride. See BRIDGET, ST.

Saint-Castin, JEAN VINCENT DE L'ABADIE, BARON DE, 1650–1712. French colonist, trader, and soldier in Acadia and Me ; founder of Castine, Me.

St. Christopher. See ST. KITTS.

St. Clair, ARTHUR, 1734–1818. British officer 1757–62, settled in Pa. 1764; Brig.-gen. 1776, Major-gen. 1777, serving in N. J., Pa., and later in the South; tried by court-martial and acquitted 1778 for evacuating Fort Ticonderoga 1777; delegate to Congress 1785–87, and its pres. 1787; Gov. Northwestern Territory 1789–1802; Commander-in-chief 1791–92; surprised and defeated by Indians in Ohio, near the Miami, Nov. 4, 1791. *Narrative*, 1812.

St. Clair, LAKE. Link in the chain of great lakes of N. America, connected with Lake Huron by St. Clair R. and with Lake Erie by Detroit R. Area 396 sq. m., elevation 576 ft.

St. Clair River. Between Lakes Huron and St. Clair. Length 41 m.

St. Cloud. Suburb of Paris, on the Seine. Its chateau, wherein Henry III. was murdered 1589 and Napoleon's coup was made 1799, was burned by the Germans 1870. Pop., 1891, 5,660.

St. Columba. See COLUMBA, ST.

St. Croix River. 1. Branch of the Mississippi, boundary between Wis. and Minn. Length 168 m., drainage area 7,164 sq. m., mean flow 6,165 cu. ft. per sec. 2. Between Me. and New Brunswick, flowing from Grand Lake s.e. to Passamaquoddy Bay. Length 75 m.

St. Cyr. Village near Versailles, site since 1806 of a military school, originally (1686–1793) one for girls of high birth. Pop., 1891, 3,613.

St. Davids. Ancient Welsh town, seat of a bishopric, in the Celtic times of metropolitan rank. The cathedral was restored 1862–78. Pop. ab.2,000.

St. Denis. 1. Suburb of Paris, site of a fine abbey-church, built 1137–44, and restored 1848 and later. 2. Capital of REUNION (q.v.). Pop., 1889, 30,560.

St. Dizier. Town of n.e. France, on the Marne, 38 m. s.e. of Chalons; besieged for 6 weeks by Charles V. 1544; scene of battles between Napoleon and the Allies, Jan. 27 and March 26, 1814. Pop., 1891, 9,476.

Ste. Anne de Beaupré. Village on the St. Lawrence, 25 m. n.e. of Quebec; resort of many pilgrims, especially on July 26, to the shrine of St. Anne, whose relics are supposed to cure diseases.

Sainte-Beuve, CHARLES AUGUSTIN, 1804–1869. French critic of highest rank; Academician 1845, Senator 1865. His early poems and a novel, *Volupté*, 1834, represent him less fairly than *Causeries du Lundi*, 13 vols., 1851–57; and *Nouveaux Lundis*, 15 vols., 1863–72, collected from the Paris *Constitutionnel* and *Moniteur*. In acuteness, penetration and delicacy he has never been surpassed. *Port Royal*, 7 vols., 1840–60; *Portraits*, tr. 1868–75.

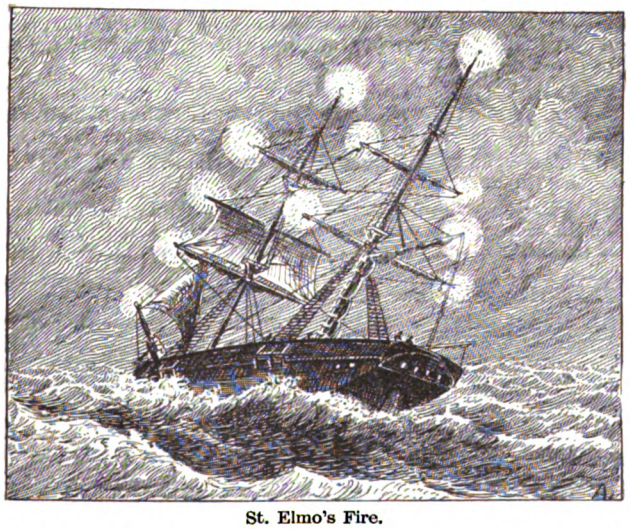
Sainte-Claire Deville, CHARLES, 1814–1876. Prof. Coll. de France 1875; geologist and meteorologist. *Voyage géologique*

Charles Sainte-Claire Deville.

aux Antilles, 7 vols., 1856–64.—His brother, HENRI ÉTIENNE, 1818–1883, prof. Paris from 1851, proved the dissociation of chemical compounds, and produced minerals, and even jewels, artificially. *Métallurgie du platine*, 1857–63; *De l'aluminium*, 1859.

St. Elias, MT. Peak of s.e. Alaska, in lat. 60° 17′ N., long. 140° 55′ W. Elevation 18,100 ft.

St. Elmo's Fire. Brushes and stars of electric light seen at tips of masts, yards and other projecting points of a vessel, principally during thunderstorms. The luminous electric discharge which takes place from these points is similar to that



St. Elmo's Fire.

called electric brush, and observed when a metallic point is presented to the prime conductor of an electric machine. When seen in a pair, it is sometimes called Castor and Pollux. It is also known as Helena, and Corporant (holy body).

Sainte-Marguerite. See LERINS.

Sainte-Maure. See BENOIT DE SAINTE-MAURE.

Saint Esprit, ORDER OF. Founded 1578 by Henry III. of France, replacing that of St. Michael, founded 1469; not increased since 1830.

St. Etienne. City of France, on the Furens, 36 m. s.w. of Lyons; taken by Huguenots 1563 and 1570; terminus of the first French railroads, 1828–31. It is in a coal-mining region, and has extensive manufactures, especially of hardware, firearms, ribbons, and laces. Pop., 1891, 133,443.

Saint-Evremond, CHARLES MARGUETEL DE SAINT DENIS, SEIGNEUR DE, 1613–1703. French writer, in England from 1662. His works, satires, comedies, essays, and miscellanea, were collected 1705.

Saintfoin. See SAINFOIN.

St. Francis River. 1. Branch of the Mississippi, draining low alluvial lands in s.e. Mo. and n.e. Ark. Drainage area 7,884 sq. m., average flow 31,000 cu. ft. per sec., length ab. 450 m. It is navigable 150 m. to Wittsburg, Ark. 2. Branch of the St. Lawrence, in Quebec. Length ab. 120 m.

St. Francis Xavier, COLLEGE OF. Founded 1847 in New York; directed by Jesuits. It has 20 instructors, ab. 150 students in the college proper, and ab. 940 in all.

St. Gall. 1. Mountainous canton of n.e. Switzerland, adjoining Lake of Constance. Area 779 sq. m.; pop., 1888, 229,441. 2. Its capital, long the site of a famous Benedictine abbey, founded by St. Gall (554–627), closed 1798. Pop., 1888, 27,910.

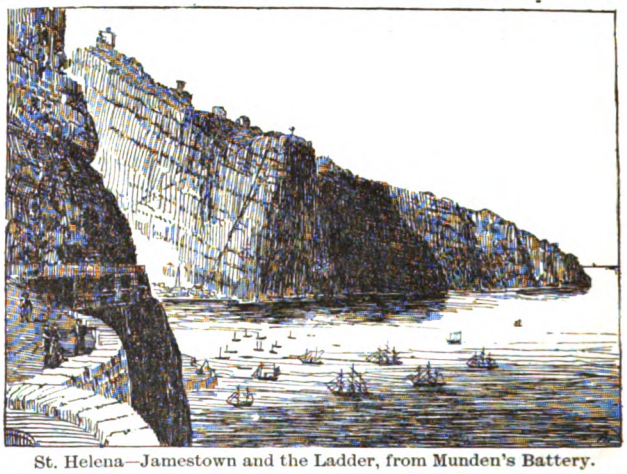
Saint Gaudens, AUGUSTUS, b.1848 in Ireland. N. A. 1889. American sculptor. Among his works are *Farragut*, in New York, and *Lincoln*, in Chicago.

St. George, ORDER OF. Founded 1769 by Catharine II. of Russia; conferred on a general who had taken the enemy's capital, secured an honorable peace, or beaten an army of 50,000. There is also a Bavarian order, dating from 1729.

St. George's Channel. Between Wales and Ireland.

St. Gotthard Tunnel. On the St. Gotthard railway, between s.e. Switzerland and Italy; built 1871–1883; 48,651 ft. long, 26 ft. wide, and 21 ft. high; longest railway tunnel yet constructed. See TUNNELING.

St. Helena. Island in the s. Atlantic, belonging to Gt. Britain since 1673; discovered by a Portuguese navigator, João de Nova, in 1502. Napoleon was confined here 1815–21. Its



St. Helena—Jamestown and the Ladder, from Munden's Battery.

shores face the ocean as perpendicular cliffs from 600–2,000 ft. high, and are in many places cleft by deep, narrow valleys. The capital is Jamestown. Pop., 1891, 4,116.

St. Helens. Borough of Lancashire, 12 m. e. of Liverpool; formed 1868. Its manufactures consist largely of plate glass and chemicals. Pop., 1891, 71,288.

St. Helier. Capital of Jersey. Pop., 1891, 29,133.

Saint-Hilaire, AUGUSTIN FRANÇOIS CÉSAR PROUVENCAL DE, 1799–1853. French botanist. *Flora Brasilianæ meridionalis*, 1825–33; *Leçons de Botanique*, 1840.

Saint-Hilaire, ÉMILE MARC, ab.1790–1887. French biographer. *Vie privée de Napoleon*, 1838; *Souvenirs intimes*, 6 vols., 1838–40.

Saint-Hilaire, JULES BARTHÉLEMY. See BARTHELEMY SAINT-HILAIRE.

St. Ignatius' Beans. See IGNATIUS' BEANS.

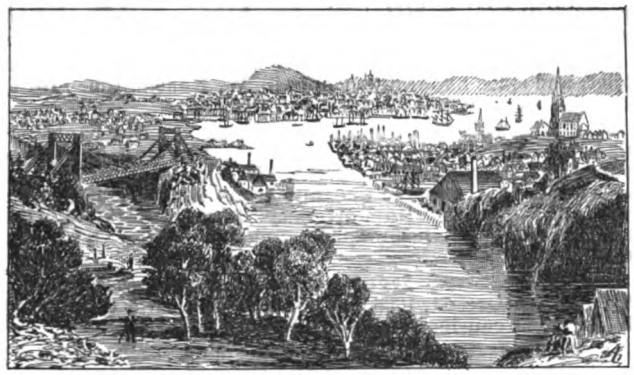
Saintin, JULES ÉMILE, 1829–1894. French painter, in New York 1857–63.

Saintine, JOSEPH XAVIER (BONIFACE), 1798–1865. French dramatist and novelist, author of *Picciola*, 1863.

St. James, COURT OF. Named from the palace built on the site of St. James's Hospital 1530–36; official residence of the English Court since 1698. The Levees are held here, but the Drawing-Rooms at Buckingham Palace.

St. James of Compostella, ORDER OF. Of Spanish origin; sanctioned by the pope 1175. It had great military power in the Middle Ages.

St. John. Chief city of New Brunswick; on Bay of Fundy at mouth of St. John River; founded as a French fort 1635; held



St. John, New Brunswick.

by the British from 1713; populated largely by Tory refugees from Mass.; chartered 1785. It has a good harbor, a fair trade, and some manufactures. Pop., 1891, 39,179.

St. John, HENRY. See BOLINGBROKE.

St. John, ISAAC MUNROE, 1827–1880. Civil engineer, chiefly in Ky. and Va.

St. John, JAMES AUGUSTUS, 1801–1875. Welsh author, biographer of Louis Napoleon, 1857, and Sir W. Raleigh, 1868. *Egypt*, 1834–44; *Hellenes*, 1842; *Isis*, 1853.—Of his sons, PERCY BOLINGBROKE, 1821–1889, was a voluminous writer; SIR SPENSER, b. 1826, was Minister to Peru 1881, to Mexico 1884, biographer of Sir J. Brooke, 1879, and author of books on Borneo, 1862, and Haiti, 1884.

St. John, JOHN PIERCE, b. 1833. Gov. of Kan. 1878–82; Prohibitionist nominee for Pres. 1884.

St. John, KNIGHTS OF. See HOSPITALERS.

St. John River. Portion of the boundary between Me. and Canada, thence flowing s. and e. through New Brunswick to the Bay of Fundy. Length 450 m., drainage area 26,000 sq.m.

St. John's. Capital of Newfoundland; on e. coast; partly burned 1846 and 1892. It has a good harbor, and large exports of fish. Pop., 1891, 29,007.

St. John's Bread. See CAROB.

St. John's College. At Annapolis, Md.; chartered 1784; opened 1789, succeeding King William's School, which began operations 1701. The State appropriates $15,000 annually. There are 14 instructors, ab.100 students of collegiate grade, and 175 in all.

St. John's College. At Fordham, New York City; incorporated 1846. It is managed by Jesuits, has 24 instructors, 217 students, and a library of 27,000 volumes.

St. John's Dance. See DANCING MANIA.

St. John's River. In Fla., heading near the e. coast and flowing n. parallel to it; navigable for small steamers. Length ab. 400 m.

St. John's University. Founded 1857 at Collegeville, Minn.; under R. C. control; entitled univ. 1883.

St. John's Wort. Herbs and shrubs of the genus *Hypericum*, natural family *Hypericaceæ*, of wide geographical distribution. *H. perforatum*, the common field species, is native of Europe, introduced as a weed into America.

Large-flowered St. John's-Wort (*Hypericum calycinum*).

St. Joseph. Capital of Buchanan co., Mo., on the e. bank of the Missouri; settled 1826–43; chartered 1851. It is supplied with water by pumping from the Missouri, and is well sewered. It has extensive manufactures and a large trade, especially in grain and pork. Pop., 1890, 52,324.

St. Just, LOUIS ANTOINE LÉON DE, 1767–1794. French terrorist; Deputy 1792, pres. Convention Feb. 1794; associated with Robespierre; guillotined July 28.

St. Kilda. Rocky islet, of the Outer Hebrides, 7 m. in circumference, 50 m. w. of Harris. The seabirds are much used as food, their feathers and oil being exported. Sheep furnish wool from which a coarse blanket is woven. Area 1.9 sq. m.; pop., 1891, 71.

St. Kitts, or ST. CHRISTOPHER. W. India island, at n. end of Leeward group; discovered 1493; settled 1625; held by Britain since 1713. Area 68 sq. m.; pop., 1891, 30,876.

St. Lawrence. River of N. America, outlet of Lake Ontario. It makes with the system of the Great Lakes a waterway, 2,150 m. long, from the head of Lake Superior to the Gulf of St. L. Its navigability is interrupted by rapids in the river proper, by the Falls of Niagara, and by the Sault Ste. Marie, all which are passed by canals. Length of the river proper, 700 m., area of the entire river and lake system, 457,000 sq. m.

St. Lawrence, GULF OF. Between Quebec, New Brunswick, Nova Scotia, Cape Breton Island, and Newfoundland; connected with the Atlantic chiefly by a wide channel between the two latter; important for its fisheries; perilous through currents and fogs.

St. Lawrence Island. In Bering Sea; discovered 1728; adjunct of Alaska.

St. Lawrence University. At Canton, N. Y.; chartered 1856. The academic department was opened 1859, the theological 1858. It has 11 instructors and 135 students of both sexes.

St. Leger, BARRY, 1737–1789. British officer, in America 1756–85. *Journal*, 1780.

St. Leonards. Town near HASTINGS (q.v.).

St. Leonards. See SUGDEN.

St. Louis. Subdivision of the CARBONIFEROUS (q.v.) or Mountain Limestone.

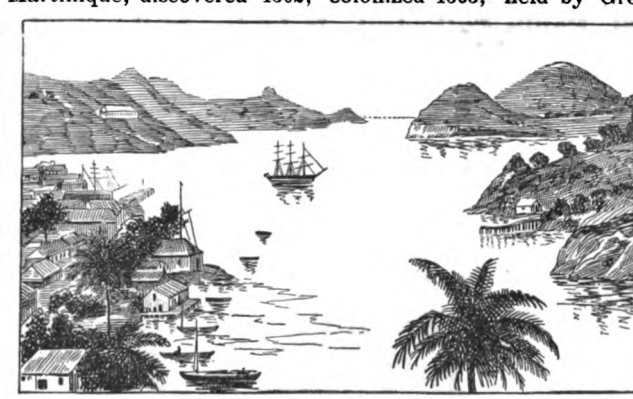
St. Louis. Capital of a French colony in w. Africa, near the mouth of the Senegal. Pop. ab. 19,000.

St. Louis. Principal city of Mo., on the Mississippi, 21 m. below the mouth of the Missouri. Water is obtained from the Mississippi River by pumping. It is well sewered, the discharge being into the river below the city. It is one of the most important railroad centers in the U. S., 15 railroads entering here. The river is crossed by 5 bridges; that of Eads is of steel tubular arches, the maximum span of which is 515 ft. Its manufactures and its river commerce are very great. St. L. was founded 1764 as a trading post by the French. It passed to the U. S. 1804 with the province of Louisiana. Its early growth was slow, having in 1840 but 16,469 inhabitants, but since that time it has grown with great rapidity. Pop., 1890, 451,770.

Saint-Luc, LA CORNE DE, 1712–1784. Canadian officer, prominent in the French wars; leader of Indians on the British side in the Revolution.

St. Lucas, CAPE. S. point of lower California.

St. Lucia. One of the Windward Is., W. Indies; s. of Martinique; discovered 1502; colonized 1563; held by Great



Port Castries, St. Lucia.

Britain since 1803. Its possession was constantly disputed from 1640–1803 between the French and English. The principal products are sugar, logwood, and tobacco. Area 245 sq. m.; pop., 1891, 43,708.

St. Mahé, BATTLE OF. April 24, 1293, between English and French fleets off the coast of Brittany. The French lost 180 ships and 8,000 men.

St. Malo. Seaport of Brittany, n.w. France; attacked by British forces 1693, 1695, and 1758; birthplace of Chateaubriand and Lamennais. Pop., 1891, 9,227.

Saint-Marc Girardin. See GIRARDIN.

St. Martin. One of the Lesser Antilles, W. Indies; held jointly since 1648 by France and Holland. Area 38 sq. m., pop. ab. 7,500.

St. Martin, ALEXIS. U. S. soldier, who received a gunshot wound 1825, which healed, leaving an opening into the stomach, through which William Beaumont, M.D. (1785–1853), made many experiments on digestion.

Saint-Martin, LOUIS CLAUDE, MARQUIS DE, 1743–1803. French mystical philosopher, influenced chiefly by Jacob Boehme. His works were more appreciated in Germany than at home.

Saint-Martin, VIVIEN, 1802–1897. French geographer.

Saint Martin's Summer. Period of pleasant weather in England usually in Nov.; in other parts of the Atlantic in Sept., Oct., and Nov., succeeding a rainy period.

St. Mary's River. Between Lakes Superior and Huron; 40 m. long. Its rapids, descending 20 ft., are passed by a canal 5,400 ft. long, constructed 1853–55, improved 1870 and 1887–95.

St. Maurice River. In Quebec, tributary to the St. Lawrence. Length 363 m., drainage area 16,000 sq. m.

Saint-Mémin, CHARLES BALTHAZAR JULIEN FÉVRE DE, 1770–1852. French engraver and painter, who took many portraits in America by aid of the physionotrace, a contrivance for copying profiles.

St. Michael and St. George, ORDER OF. British order, founded 1818; designed to honor such (Ionians, Maltese, or British) as had served with distinction in the Mediterranean.

St. Michaels. Most important of the Azores. Area 300 sq. m., pop. ab.130,000. It is noted for its oranges.

St. Michael's Mount. Ancient Dinsol. Rock in Mounts Bay, Eng., resembling Mont St. Michel in Normandy. It is connected with the shore by a causeway, and is surrounded by a castle dedicated to St. Michael. Altitude 238 ft.

St. Michel, MONT. Precipitous islet on the Norman coast, n.w. France; 18 m. s.w. of Avranches; 242 ft. high; site of an old Benedictine abbey, now a museum.

St. Moritz. Watering-place with mineral springs. See ENGADINE.

St. Nicholas, or NICOLAS, d. 326. Bishop of Myra in Lycia, in time of Diocletian, by whom he was imprisoned, and released by Constantine. Patron saint of Russia and of children. His day is Dec. 6.

St. Omer. Town of n. France, 26 m. s.e. of Calais; site of an English R. C. college 1592–1794, now a theol. sem. Pop., 1891, 17,865.

Sainton, CHARLOTTE HELEN (DOLBY), 1821–1885. English contralto singer, composer of cantatas and songs.

St. Paul. City of Ramsey co., Minn., on the left bank of the Mississippi; settled 1838–41, chartered 1849–54. It is irregularly laid out, is supplied with water by gravity, from lakes back of the city, and has an excellent sewer system. Its railroad communications are ample, and its manufactures large and varied; its recent growth has been very rapid. Pop., 1890, 133,156.

St. Paul de Loanda. See LOANDA.

St. Paul's Cathedral. In London, on the site of a church founded by Ethelbert 610, burned in 962, rebuilt, and

St. Paul's Cathedral.

burned 1087, and in the great fire of 1666. It was 590 ft. long, and surmounted by a wooden spire 460 ft. high. The present edifice was erected by Sir Christopher Wren in 1675–1710, at a cost of $3,700,000. It has ab. half the area of St. Peter's, being in form of a Latin cross, 500 ft. long, 250 ft. wide at the transept and 404 ft. high to the top of the cross. The interior dome rises 225 ft. from the pavement.

St. Paul's School. Founded in London 1509 by Dean Colet, and since maintained; now in W. Kensington. Its departments now admit 400 girls and 1,000 boys.

St. Petersburg. Capital of Russia, on the banks and islands of the Neva, at its mouth in the Gulf of Finland; founded 1703 by Peter the Great. It is a beautiful city, and has extensive commerce and numerous institutions of learning and the arts. Its university, founded 1819, has four faculties, and (in 1896) 2,625 students. Pop., 1890, with suburbs, 1,036,324.

St. Petersburg Declaration. By representatives of 17 countries, Dec. 11, 1868, against the use in war of explosive rifle-balls, as causing needless suffering and death.

St. Peter's-Wort. Plants of the genus *Ascyrum*, natural family *Hypericaceæ*, natives of the s.e. U. S.

Saint-Pierre, JACQUES HENRI BERNARDIN DE, 1737–1814. French author, best known by *Paul et Virginie*, 1788. *Ile de France*, 1773; *Études de la Nature*, 3 vols., 1784. His later writings are inferior. *Works*, 12 vols., 1813–20.

St. Pierre and Miquelon. Group of islands at the mouth of the Gulf of St. Lawrence, near the s. coast of Newfoundland, belonging to the French. Several transatlantic cables touch here. It is frequented as a cod-fishing station. Area 81 sq. m.; pop., 1889, 5,983.

St. Quentin. City of n. France, on the Somme. A Spanish victory here, Aug. 10, 1557, was followed by hideous cruelties, and led to no permanent result. Jan. 19, 1871, the Germans defeated a French army here, and took 10,000 prisoners.

Saint-Réal, CÉSAR VICHARD, ABBÉ DE, 1631–1692. French historian. His *Conjuration contre Venice*, 1674, is still valued.

Saints. In N. T., all persons consecrated to God by Christian belief and profession; in Ch. use, the Apostles and others, biblical, or canonized for supposed eminent holiness and great services to religion; in popular usage, any of especially beautiful character or beneficent life.—The worship of canonical saints, *i.e.*, prayers for their intercession, grew by degrees, and was recognized in the East 787, and confirmed in the West at Trent 1563. Protestants have always rejected it.

Saint-Saëns, CHARLES CAMILLE, b. 1835. French musician, almost equally excellent as organist, pianist and composer. His most successful compositions are four symphonic poems, *Phaëton*, *Le Rouet d'Omphale*, *La Jeunesse d'Hercule*, and *Danse Macabre*, and one of his four pianoforte concertos in G minor. His operas, *Le Timbre d'Argent*, *La Princesse Jaune*, *Samson et Dalila*, *Étienne Marcel*, *Henri VIII.*, *Proserpine*, *Ascanio*, and *Phryné*, though among the best of contemporary French production, have been less successful.

Saintsbury, GEORGE EDWARD BATEMAN, b. 1845. English critic; historian of French and Elizabethan literature, 1882–87; biographer of Dryden and Marlborough, 1881–85; prof. Univ. Edinburgh 1895. *French Novelists*, 1891.

Saint-Simon, CLAUDE HENRI, COMTE DE, 1760–1825. French socialist, of strange and adventurous life, but of large economic influence. *Reorganization de la Société Européenne*, 1814; *L'Industrie*, 1817; *Le Système Industriel*, 1821; *Catechisme Industriel*, 1824; *Nouveau Christianisme*, 1825.

Saint-Simon, LOUIS DE ROUVROI, DUC DE, 1675–1755. French writer of *Memoirs*, giving a graphic picture of the court of Versailles. Parts of them were pub. 1830, and in 20 vols. 1856; tr., 4 vols., 1857. An edition, begun 1871, is in progress.

St. Simonianism. Doctrines taught by the disciples of St. Simon, departing considerably from his own tenets, and ultimately leading to the prosecution of the members of the community, which was suppressed 1832.

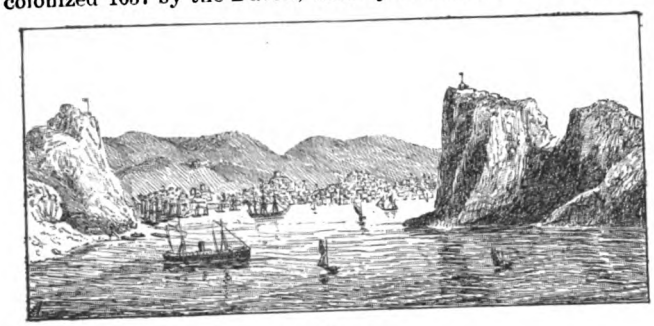
St. Sophia, MOSQUE OF. One of the oldest churches in existence; built at Constantinople by Justinian 532–557; since 1453 a mosque. It covers 70,000 sq. ft. See ARCHITECTURE.

St. Stephen, ORDER OF. Instituted in Hungary by Maria Theresa May 5, 1764.

St. Sulpice. Diocesan seminary for priests in Paris, near the Luxembourg.

St. Thomas. Volcanic island in Gulf of Guinea; discovered 1470; colonized by Portuguese 1493; held by them till 1641 and since 1844, and in the interval by the Dutch. Area 360 sq. m., pop. ab. 19,000.

St. Thomas. Island 36 m. e. of Porto Rico, W. Indies; colonized 1657 by the Dutch; held by Denmark. In 1870 Pres.



St. Thomas.

Grant secured the purchase of the island for the U. S. for $7,500,000, but the Senate refused to ratify the treaty. Area 33 sq. m.; pop., 1890, 12,019.

St. Victor, ADAM OF. See ADAM OF ST. VICTOR.

St. Victor, HUGO OF, 1097–1141. Flemish mystical theologian.

Saint-Victor, PAUL DE, 1827–1881. French author and journalist, noted for elaborately brilliant style. *Hommes et Dieux*, 1867; *Les Deux Masques*, 1879–83; *Victor Hugo*, 1885.

St. Vincent. One of the Windward Is., W. Indies, 105 m. w. of Barbadoes; discovered 1498; held by Caribs till 1795, and since by the British. Area 132 sq. m.; pop., 1891, 41,054.

St. Vincent, CAPE. See CAPE ST. VINCENT.

St. Vincent, JOHN JERVIS, R.N., EARL, 1734–1823. Admiral 1795, Earl 1797.

St. Vitus's Dance. See CHOREA and DANCING MANIA.

Saka. Siamese game of backgammon, played on the same board and in the same manner as the European game, except that the tunicula or little tower of the classical writers, through which the dice are thrown, is retained, the dice being discharged into it from a cannon-shaped ivory cylinder called Krabok.

Sakuntala. Sanskrit dramatic poem by Kalidasa, tr. 1789.

Sakyamuni. See BUDDHA.

Sala, GEORGE AUGUSTUS HENRY, 1828–1895. English journalist, novelist, and descriptive writer; founder of *Temple Bar*. *Life*, 1895.

Salaam. Oriental salutation, usually accompanied by the words meaning "Peace be with you!" In India the body is inclined, sometimes almost to the ground, with the palm of the right hand upon the forehead. Strict Mohammedans never give the salaam to an unbeliever.

Salaberry, CHARLES MICHEL DE, 1778–1829. Canadian officer, prominent in the war of 1812–15.

Salad. Lettuces, endive, and other herbs eaten raw, dressed with vinegar, oil, and other condiments. They contain more of the mineral matter than when boiled.

Saladin, 1137–1193. Ruler of Egypt 1171 and Syria 1184. He invaded Palestine with 80,000 men, routed the Christians at Tiberias July 4, 1187, and took Jerusalem Oct. 2. This gave rise to the 3d Crusade, 1189, and a series of brilliant conflicts between S. and Richard Cœur de Lion, followed by a 3 years' truce, Sept. 1192.

Salado, RIO. River of Argentina, rising in the Andes and flowing s.e. to the Parana; near 1,000 m. long.

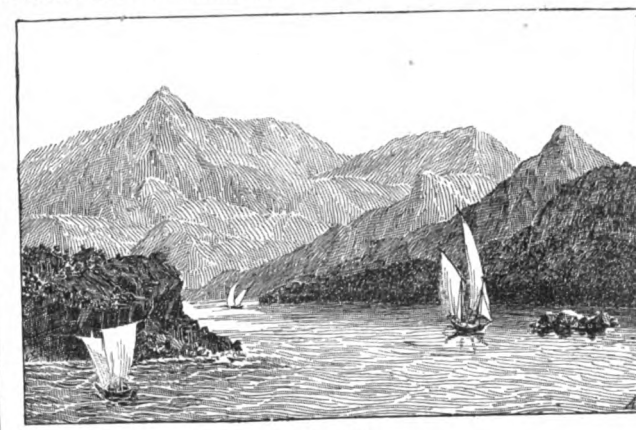
Sal Alembroth. Made from corrosive sublimate. Its composition is expressed by $HgCl_2 2NH_4Cl.H_2O$.

Salamanca. Town of w. Spain, on the Tormes, 110 m. n.w. of Madrid; taken 222 B.C. by Hannibal, 1055 by Christians from Moors, and 1812 by the French, who were defeated by Wellington July 22, 1812. Its university, founded 1243, was famous and important till after 1600: it has a library of 80,000 vols., and ab. 400 students. Pop. ab.22,000.

Salamander. In America, loosely, most of the tailed Amphibians; in Europe, a single family distinct from New World forms. The common European animal has a skin which secretes much fluid, enabling it to withstand fire to a considerable degree. In s. U. S., the Gopher (*Geomys*) is called a salamander.

Salamandrina (CADUCIBRANCHIATA, MYCTODERA, SALAMANDROIDA). Sub-order of *Urodela*, characterized by having no external gills or gill apertures. They have four-toed front feet and five-toed hind limbs. The eyes are furnished with lids. The skin is covered with warty glands. The land Salamanders are viviparous, but the larvæ are deposited in the water. The aquatic Salamanders, known as Tritons or Newts, lay fertilized eggs upon plants in the water. The vertebræ are opisthocœlous. The general appearance of these animals is Lizard-like. See AXOLOTL, AMBLYSTOMA, and SALAMANDER.

Salamis. Island s.w. of Attica, held successively by Megara and Athens; memorable for the decisive defeat of the Persian fleet 480 B.C. by the Greeks under Themistocles. It



Salamis.

is irregular in shape, the surface is mountainous and wooded in some parts; on the coast, wheat, wine, and olives are grown.

Sal Ammoniac. NH_4Cl. AMMONIUM CHLORIDE (q.v.). It is found occasionally as a natural mineral substance in volcanic regions, like those of Italy and the Hawaiian Islands.

Salamstone. Reddish and bluish colored varieties of sapphires from Ceylon.

Salary Grab. General increase in Federal salaries 1873; especially retroactive section of act of March 4, which raised the salaries of members of Congress for the two years preceding. This was repealed in consequence of popular indignation, but the salaries of the President and Justices were not reduced.

Salas, MARIANO, 1797–1867. Mexican general 1839; prominent in the war of 1846–47; banished 1860–62.

Salaverry, FELIPE SANTIAGO DE, 1806–1836. Peruvian general 1834; supreme chief or dictator 1835; executed.

Salband. Term used in the same sense as FLUCAN and SELVAGE (q.v.).

Saldanha Oliveira e Daun, JOAO CARLOS, 1791–1876. Portuguese Marshal 1833; in exile 1836–46; Duke 1846; Premier 1847–49, 1851–56, and 1870; Ambassador at Rome 1862–64 and 1866–69, and to England from 1870.

Sale. Transfer of property, or contract to transfer it, for a price in money; generally, in English law, movable personal property. It is sometimes difficult to determine whether a transaction is sale or bailment, lease or mortgage: but if it is to evenutate in the transfer of the general property in a chattel for a money consideration, it is a sale. In case of a contract for the present sale of a specific chattel, title passes upon the formation of the contract, though the seller has a right to retain the chattel until the price is paid; in case of a contract to sell in the future, title will pass as soon as the chattel is unconditionally appropriated to the contract by the act or assent of both parties. At common law, no one can give a better title to goods than he possesses (except in case of sales in market overt in England); but this has been modified to some extent by Factors' acts and other statutes.

Sale, GEORGE, ab.1690–1736. English translator of the *Koran*, 1734; eminent as an Oriental scholar.

Sale, SIR ROBERT HENRY, 1782–1846. Anglo-Indian officer from 1795; Major-gen. and Knight 1839 for services in Afghanistan, especially at Ghazni; besieged at Jellalabad Nov. 1841–April 1842, but victorious; mortally wounded in battle with the Sikhs.

Salem. Poetical name of Jerusalem; as previously of a

city, probably in middle Palestine, of which MELCHIZEDEK (q.v.) was king (Gen. xiv.).

Salem, or SHELAM. Town of s. India, 120 m. s.w. of Madras; noted for its cotton manufactures. Pop., 1891, 67,750.

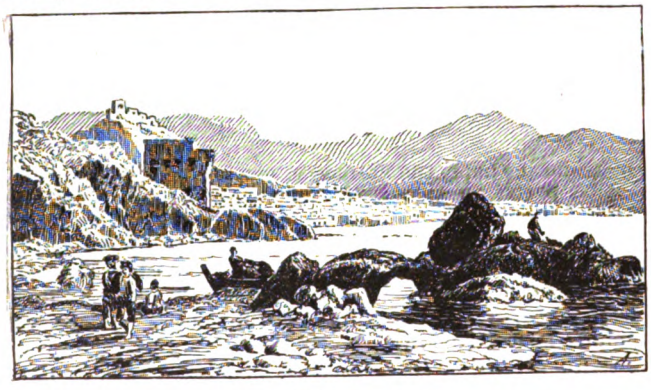
Salem. City of Essex co., Mass., on the n. shore of Massachusetts Bay, 16 m. n.e. of Boston; settled 1626, chartered 1836; seat of the Essex Institute and the Peabody Academy of Science. It has some fisheries and varied manufactures, principally of leather. Ab.1780–1825 its foreign commerce was extensive, but of late it has dwindled greatly. Pop., 1890, 30,801.

Salem. Capital of Oregon since 1860; in Marion co., on the Willamette, 52 m. s. of Portland; founded ab. 1835, chartered 1853; site of WILLAMETTE UNIV. (q.v.), opened 1844. Pop., 1890, 4,515, since much increased.

Salem Witchcraft. Mania against so-called witchcraft which raged generally in the American colonies, and with special violence at Salem, Mass. 19 persons were put to death 1692, and 150 lay in prison awaiting their fate, when the popular reaction against the excitement set in.

Saleratus. Term applied in the U. S. to a baking powder, consisting of a mixture of salt, cream of tartar, and carbonate of soda. Formerly potassium bicarbonate.

Salerno. Town of s. Italy, 33 m. s.e. of Naples; settled from Rome 194 B.C.; Robert Guiscard's capital 1077; sacked by Henry VI. 1195; seat of a university 1150–1817, and of a school



Salerno.

of medicine famous ab.900–1300: it began to decay by reason of the introduction of Arabian medical knowledge, and was dissolved by Napoleon I. in 1811. Pop. ab 39,000.

Sales, FRANCIS DE. See FRANCIS OF SALES.

Salette, LA. Village of s.e. France, 28 m. s.s.e. of Grenoble; noted for alleged appearances of Virgin Mary 1846 and later; hence a place of pilgrimage till disapproved 1879 by the pope.

Saleyer Is. Group of ab.30 in E. Indies, s.w. of Celebes. Area near 300 sq. m., pop. ab.50,000, chiefly Malays.

Salford. Suburb of Manchester. Pop., 1891, 198,139.

Salicaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising two genera (*Salix*, the willows, and *Populus*, the poplars and aspens) and ab.200 species, most widely distributed throughout the temperate and frigid zones of the n. hemisphere; called the Willow family.

Salicetum. Garden devoted to the cultivation of willows.

Salicin. $C_{13}H_{18}O_7$. White crystalline glucoside, found in willow bark, and in the bark and leaves of poplars; decomposed by boiling with water into dextrose and saligenin. It is given in intermittent fevers.

Salic Law. Legal manual regulating the succession to private property, and supposed to exclude females and their descendants from succession to thrones. It regulated the succession to the French crown, and was the cause of the 100 years' war with England. It was operative also in Spain 1713–1830.

Salicylic Acid. C_6H_4:OH.COOH. Orthohydroxybenzoic acid; white crystalline substance, melting at 155° C., soluble in hot water; prepared by the decomposition of methyl salicylate by alkalies, but commonly by the action of carbonic acid upon sodium phenylate; important antiseptic, largely used in pharmacy, in the manufacture of methyl salicylate, and for the preservation of beer, cider, and manufactured preserves.

Salicylic Aldehyde. C_6H_3:OH.CHO. Orthohydroxybenzaldehyde, formed by the oxidation of saligenin, and found in *Spiræa;* liquid, bpt. 196.5° C., with a strong odor; easily oxidized to salicylic acid; made by treating phenol with chloroform and caustic soda.

Salicylic Methyl Ether. See METHYL SALICYLATE.

Salient Angle. Interior angle of a polygon less than 180°.

Salient Polygon. One in which all angles are salient.

Salient Polyhedron. One all plane sections of which are salient polygons.

Salieri, ANTONIO, 1750–1825. Italian opera composer and conductor, pupil of Gluck; Court Chapelmaster at Vienna 1788–1824; teacher of Schubert. His intrigues against Mozart led to the fiction that he had poisoned Mozart.

Saligenin. C_6H_4:OH.CH_2OH. Orthohydroxybenzyl alcohol; white plates, melting at 82° C.; prepared by the decomposition of salicin. It gives salicylic aldehyde and acid upon oxidation.

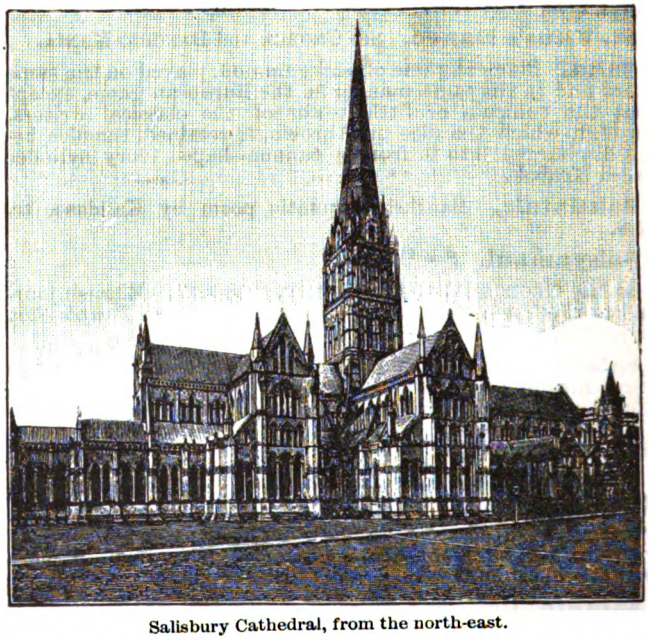
Salii. College of priests at Rome, dedicated by Numa to the service of Mars. Every March, with songs and dances, they made solemn processions about the city and the sacred places.

Salimeter. See HYDROMETER.

Saline. Place where salt is obtained by the evaporation of natural brines.

Saline Plants. Plants growing on the seashore or in salt water. Few of them are aquatic, except Sea-weeds. See EEL GRASS and SALTWORTS.

Salisbury, or NEW SARUM. Capital of Wiltshire, 84 m. w.s.w. of London; noted for its fine cathedral, erected 1220–1330. The cathedral is 473 ft. long and the spire 404 ft. high.



Salisbury Cathedral, from the north-east.

The old cathedral was at Old Sarum, 2 m. off, and was removed 1220. Old Sarum was an important town in Roman times. Pop., 1891, 17,362.

Salisbury, RICHARD ANTHONY, 1761–1829. English botanist. *Paradisus Londinensis*, 1806–7; *Genera of Plants*, 1866.

Salisbury, RICHARD NEVILLE, EARL OF, d. 1661. Yorkist chief in the War of the Roses; executed.

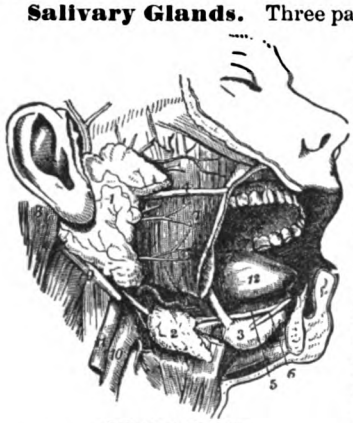
Salisbury, ROBERT ARTHUR TALBOT GASCOYNE CECIL, MARQUIS OF, b. 1830. M.P. 1853; Viscount Cranborne 1865; Sec. for India 1866–67 and 1874; Marquis 1868; Conservative leader; Foreign Sec. 1878–79; leader, with Disraeli, of opposition 1879–85; Premier 1885, 1886–92, and since 1895.

Salisbury, ROBERT CECIL, EARL OF, 1550–1612. Son of Lord Burleigh; Minister of Elizabeth and James I.; Earl 1605; Lord High Treasurer 1608.

Saliva. Mixed secretion of the salivary glands and of the mucous glands of the mouth, an alkaline fluid whose most important constituent, in man, is ptyalin, a substance changing starch into grape sugar in an alkaline medium. The other uses of saliva are chiefly mechanical, moistening the food dur-

ing mastication, rendering the resulting bolus more easily swallowed. The composition of saliva is water 99.4, ptyalin 0.14, mucus 0.15, fat 0.13, sulphocyanides 0.01, salts 0.17; also globulin and mucin in small quantities.

Salivary Glands. Three pairs of racemose glands secreting the saliva. The parotid, situated in front of the external ear down to the angle of the jaw; the submaxillary, just below the base of the lower jaw; and the sublingual, on the floor of the mouth. They communicate with the cavity of the mouth by means of ducts, through which the saliva flows.



Salivary Glands:
1, the parotid gland; 2, the submaxillary gland; 3, the sublingual gland; 4, Steno's duct; 5, Wharton's duct; 6, Bartholin's duct; 7, masseter muscle; 8, mastoid process; 9, digastric muscle; 10, internal jugular vein; 11, external carotid artery; 12, the tongue.

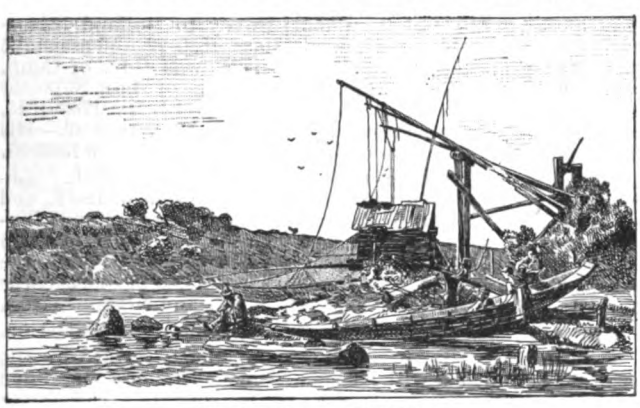
Sallust, CAIUS SALLUSTIUS CRISPUS, 86–34 B.C. Roman historian of great merit, from whom we have a history of the Conspiracy of Cataline, another of the War with Jugurtha, and fragments of a general history of Rome from 78 B.C.

Sally-Port. Passage by which a garrison may make a sudden attack upon besiegers.

Salmagundi. Italian dish, originally consisting of minced meat, eggs, anchovies, onions, and oil; now a mixture of various ingredients, a miscellany. The word is sometimes corrupted in English to salomon-gundy.

Salmasius, CLAUDIUS, 1588–1653. French scholar, prof. Leyden 1631; considered the most learned man of his day. His *Defensio regia pro Carolo I.*, 1649, was acrimoniously answered by Milton.

Salmo. Genus of family *Salmonidæ*, including *S. salar*, Atlantic Salmon, *S. trutta*, Sea-Trout or Salmon Trout, and the Black Spotted Trout of the rivers and lakes of Europe and w. N. America, of which *S. fario*, *S. gairdneri*, *S. irideus*, and *S. purpuratus* are examples. The Atlantic Salmon is steel blue above, with black spots, most numerous in the female, distributed on the back. There are teeth on the vomer, which disappear with age. When the salmon runs up the rivers, the color fades and the male acquires orange patches and gets a more hooked under jaw. The average weight is less than 15 lbs., though an exceptional weight of over 80 lbs. is recorded. The salmon is rare in rivers s. of Cape Cod, although, before the Hudson, Delaware, and streams of N. J. were polluted by factory waste, they ran in these streams. After spawning,



Salmon Fishery on the Rhine.

the parents are called kelts, which, unlike the quinnat, do not perish, but return to the sea. The spawning is done in the fall and the eggs hatch as parrs the next spring. They remain in the river two years, descending the third spring. When a year old, the parr is called a pink, and when it descends the river, it is a smolt. In the sea it grows rapidly into a grilse, or young Sea Salmon. The parr has two or three black spots on the opercle, several black and orange spots on the back, and 12 to 15 bluish bars on the sides. As it becomes a smolt the fins get darker. The salmon which have become land-locked are the variety *sebago*. *Salmo trutta* is a smaller, weaker fish, with smaller scales. Black Spotted Trout salmon of fresh water have the vomerine teeth persistent. *S. fario* is the European Trout, the corresponding American form being the Rainbow Trout, *S. irideus*, which is believed to become the *S. gairdneri* or Steel-head as it grows older. It returns to the sea when the fall run of Quinnat occurs. These fish are small in small streams and in warmer waters, while in lakes and the north a weight of 20 lbs. (6 in the *irideus*) is attained. For the fish which is called Brook Trout, Lake Trout, etc., in e. U. S., see SALVELINUS. In 1891 the salmon packed in Alaska was 800,000 cases, on the Columbia River 390,000 cases, and elsewhere in U. S. 200,000 cases, 48 lbs. in each case.

Salmon. Fish of this name may be referred to two genera, ONCORHYNCHUS and SALMO (q.v.). The former includes the Quinnat or Columbia River Salmon; the latter includes the Atlantic Salmon. See ISOSPONDYLI and SALMONIDÆ.

Salmon, GEORGE, D.D., LL.D., D.C.L., F.R.S., b. 1819. Prof. Trinity Coll., Dublin, 1866, Provost 1888; writer on Higher Algebra, Conic Sections, Higher Plane Curves, and Geometry of three dimensions. *Introduction to N. T.; Gnosticism*, 1887.

Salmon Brick. Brick intermediate in quality between soft and hard, and usually having a salmon color.

Salmond, STEWART DINGWALL FORDYCE, D.D., b. 1838. Prof. Free Ch. Coll., Aberdeen, 1876; ed. *Critical Review*, 1891. *Sabbath*, 1880; *Immortality*, 1894.

Salmoneus. In Grecian Mythology, son of Æolus, the founder of the Æolic race. He boasted himself the equal of Zeus, and was slain by him.

Salmonidæ. Isospondylous fishes, with elongate body covered with cycloid scales, the head naked, a supplemental bone forming the lateral margin of upper jaw, an adipose fin present, caudal fin forked, abdomen rounded, no oviduct (eggs escaping by abdominal pore), and many large cæca at pyloric end of stomach. Included are Whitefish (*Coregonus*), Grayling (*Thymallus*), Quinnat (*Oncorhynchus*), Salmon Trout (*Salmo*), and Chars (*Salvelinus*).

Salmon River. In Idaho, flowing n. and w. to the Snake; length 450 m. The S. R. Mts. are on its head waters.

Salm-Salm, FELIX, PRINCE, 1828–1870. Prussian officer, Col. U. S. Vols. 1861–65; aid to Maximilian 1866–67; killed at Gravelotte. *Diary in Mexico*, 1868.—His wife, AGNES (LECLERCQ), 1842–1881, m. 1862, American actress, bore part in his campaigns, labored to save Maximilian, and pub. *Ten Years*, 1875.

Salnave, SYLVAIN, 1832–1870. Haytian insurrectionist; Pres. 1867–69; executed.

Salò, GASPAR DA, ab.1550–1610. Italian maker of viols in Brescia. His best instruments are VIOLAS (q.v.) and bass viols. He was the teacher of MAGGINI (q.v.), and the founder of the Brescian School of violin making.

Saloff, BASILE DE, b. 1829. Russian engineer, Director-gen. of railways 1887.

Salol. $C_6H_4{:}OH.COOC_6H_5$. Phenyl salicylate; colorless crystals, prepared by the action of phosgen upon a mixture of salicylic acid and phenol; largely used as an antiseptic, and in medicine.

Salome. 1. Wife of Zebedee, mother of the Apostles James and John, perhaps sister of the Virgin Mary. 2. Daughter of Herodias (Matt. xvi.).

Salomon, JOHANN PETER, 1745–1815. German-English violinist and composer.

Salomon, LOUIS ÉTIENNE FÉLICITÉ, 1820–1888. Pres. of Hayti 1880–88.

Salomon Islands. See SOLOMON ISLANDS.

Salona. City of Dalmatia, on an arm of the Adriatic; Roman colony 78 B.C.; long a prominent seaport; destroyed by Avars 639; birthplace of Diocletian, whose vast palace, occupied 305–313, was 3 m. s.w., on the site of Spalato.

Salonica. City of Macedonia, at the head of the Gulf of S.; of much commercial importance; anciently THESSALONICA (q.v.). Pop. ab.122,000, one-half Jews.

Salpæformes. See ASCIDIANS.

Sal Prunella. Fused niter cast into sticks or balls.

Salps (SALPIDÆ). Tunicates of the class THALLIACEA (q.v.). *Salpa* is the typical example. They are cylindrical, with bodies surrounded by hoop-like bands of muscles. The sexual animals are produced by budding from solitary forms, by means of a stolon, so as to be united in chains, each hermaphrodite zoöid containing only one egg, which develops viviparously, by means of a placenta. The ovum matures before the sperma-

tozoa do, in each zoöid successively, and must be fertilized by the next older, preceding zoöid.

Salsette. Island adjoining Bombay; held by Portugal ab. 1510–1739, and by Gt. Britain since 1774; noted for its cave-

Inhabitants of the Island of Salsette.

temples; the great Keneri cave belongs mainly to the 5th century. S. has many rice-fields and palm trees. Area 241 sq. m., pop. ab.112,000.

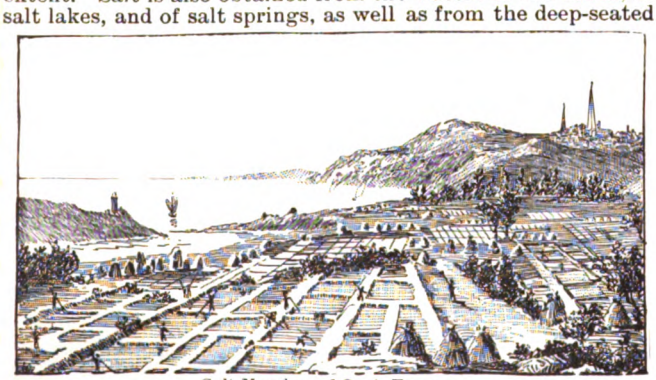
Salsify, or OYSTER-PLANT. *Tragopogon porrifolius.* Coarse herb of the Composite family, native of Europe; extensively cultivated in gardens for its large white root, used as a vegetable; sparingly introduced as a weed into N. America.

Sal Soda. See SODIUM CARBONATE.

Salsuginous. Plants growing naturally in sandy soil.

Salt. Acid, basic, normal, neutral, double, primary, secondary, tertiary, etc. See SALTS.

Salt. NaCl. Common salt is a chemical compound of sodium and chlorine. Though readily soluble in water, it is found abundantly in rock form as an important mineral component of the earth's crust. Rock salt, known mineralogically as halite, occurs in all the more extensive geological formations from the Silurian to the Tertiary, and is sometimes found in beds hundreds of feet in thickness and of great lateral extent. Salt is also obtained from the waters of the ocean, of salt lakes, and of salt springs, as well as from the deep-seated



Salt Marshes of Oust, France.

brines in stratified porous rocks that are reached by borings through the superjacent strata. In 1895 the production of salt in the U. S. was over 13,000,000 barrels of 280 lbs. each, of which over 5,000,000 were obtained from Silurian formations in N. Y., and nearly 4,000,000 from Silurian and Subcarboniferous formations in Mich. Among the largest and best known of the salt deposits of the world are those lying in a territory that includes a large area in N. Germany and extends both e. and w. beyond its limit. The product of U. S. 1895 was 173,-662 tons of rock-salt, and 1,539,178 tons of evaporated salt.

Salt, SIR TITUS, 1803–1876. English cloth manufacturer and philanthropist; founder of a model village, Saltaire, near Bradford, with schools, workmen's institutes, etc., 1853; M.P. 1859, Baronet 1869.

Salt, SPIRIT OF. Old name for hydrochloric acid.

Saltatoria. 1. *Orthoptera*, with jumping legs. The group includes the ACRIDIIDÆ (*Grasshoppers*), LOCUSTIDÆ, and GRYLLIDÆ (q.v.). 2. Group of Australian Marsupials. See ENTOMOPHAGA.

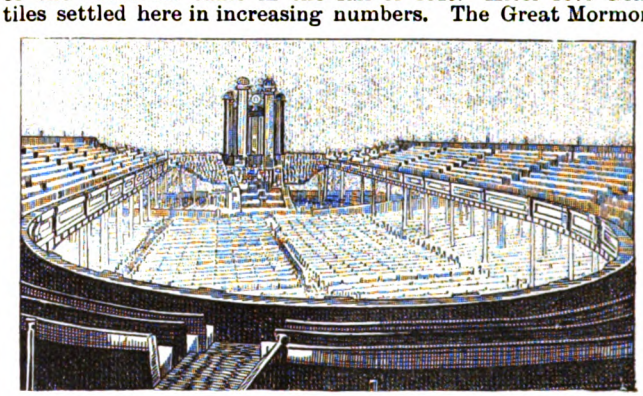
Saltatory Evolution. 1. Development of new species suddenly by sporting or otherwise, but still biogenetically. A few instances of sporting are known, and doubtless a species could be established in this way; but such sports are the results of emphasis of the forces ordinarily at work producing variation, hence not necessary to a theory of the origin of species. 2. That form of evolution which undergoes periodic accelerations in the geologic history of the earth. Doubtless but one law need be evoked to explain all these modifications.

Salt-Cake. Anhydrous sodium sulphate. The salt-cake process for making SODIUM CARBONATE (q.v.) is so called because sodium chloride is heated with sulphuric acid, which forms salt-cake.

Salter, JOHN WILLIAM, 1820–1869. Paleontologist to Geol. Survey of Gt. Britain: with Dr. H. Woodward he prepared a tabular view of British Fossil Crustacea, showing their range in time.

Saltigradæ. See SPIDERS.

Salt Lake City. Capital of Utah and of S. L. co., at w. base of the Wasatch Mts., near the shore of Great Salt Lake. It was founded by Brigham Young July 1847; the main body of the Mormons came in the fall of 1848. After 1870 Gentiles settled here in increasing numbers. The Great Mormon



Interior of Mormon Tabernacle.

Temple, a massive granite structure, was 40 years in building and cost ab. $4,000,000: it measures 186 by 99 ft. The Tabernacle is a huge auditorium with self-supported wooden roof seating 10,000 people. The UNIV. OF UTAH (q.v.) was founded 1850. Pop., 1890, 44,843.

Salt of Saturn. Acetate of lead.

Salt of Sorrel. Binoxalate of potassium.

Salt of Tartar. Crude carbonate of potassium.

Saltonstall, SIR RICHARD, 1586–1658. First assistant of Mass. 1630; in England from 1631; Envoy to Holland 1644.—His son, RICHARD, 1610–1694, was in Mass. 1630–72, and assistant 1637.—His grandson, GURDON, 1666–1724, was Gov. of Conn. from 1708.—His nephew, RICHARD, was Judge of Mass. Superior Court 1730–55.—His grandson, LEVERETT, LL.D., 1783–1845, was Mayor of Salem, Mass., 1836–38, and M.C. 1838–43.—His grandson, LEVERETT, 1825–1895, was Collector of Boston 1885–89.

Saltpeter, NITER, or POTASSIUM NITRATE. KNO_3. Obtained principally from the natural nitrate soils of India, and the artificial niter beds of France, Germany, Sweden and Hungary: the former yields about one-fifth the weight of the soil in impure crystals, which is the source of the supply in U. S.: the artificial beds yield about a quarter of a pound per bushel of earth annually. See POTASSIUM NITRATE, NITER, and NITRIFICATION.

Salt-Rheum. Popular name for weeping form of eczema.

Salts. Generally, crystalline compounds, formed by the treatment of an acid with a base. They consist of a metal and an acid radical; *e.g.*, sodium sulphate, Na_2SO_4. Normal or neutral salts are those containing neither acid nor basic residues. They are derived from acids by the replacement of all the available hydrogen by a metal or metals. Acid salts are those derived from acids by replacing a portion of the available hydrogen by a metal; *e.g.*, acid potassium sulphate, $KHSO_4$. Basic salts are those derived from bases by replacing a portion of the hydroxyl with an acid residue; *e.g.*, basic bismuth nitrate, $Bi(OH)_2NO_3$, derived from $Bi(OH)_3$. Primary salts are those derived from polybasic acids by the replacement of one atom of hydrogen by a univalent metal; *e.g.*, primary sodium phosphate is NaH_2PO_4. If the metal is bivalent, the primary salt is derived from two molecules of the acid; thus primary calcium phosphate is $CaH_4(PO_4)_2$. Secondary salts are those derived from the acid by the replacement of two atoms of hydrogen by the metal. In a tertiary salt the metal replaces three atoms, hydrogen, etc. Double salts are those

formed by the union of molecules of different substances; *e.g.*, potassium and zinc sulphates unite to form $K_2SO_4.ZnSO_4.6H_2O$. Aluminium and sodium chlorides form $AlCl_3.3NaCl$. See ETHEREAL SALTS.

Saltus, EDGAR, b.1858. American novelist. *Philosophy of Disenchantment*, 1885; *Anatomy of Negation*, 1886; *Tristrem Varick*, 1888; *The Pace that Kills*, 1889.—His cousin, FRANCIS, 1849–1889, pub. *Honey and Gall*, 1873, and left many poems, some of which his father printed in unique and luxurious form.

Salt Water. Always heavier than fresh water. For the Gulf of Mexico the weight per cubic foot is ab.63.9 lbs., for the oceans ab.64.1, while for the Dead Sea it is ab.73.

Saltwort. *Salsola kali.* Pungent leaved plant of the seashore and saline regions, natural family *Chenopodiaceæ*, of wide geographical range; also other species of the genus. Soda ash was formerly obtained from its ashes in Britain. *S. sativa* was used for the same purpose in Spain.

Salutation. Greeting by words, shake of the hands, bowing, embracing, or kissing.

Salute. Graded compliment by the Army or Navy to persons of distinction or superior rank, by firing of guns, manning the yards and otherwise; from 17 to 21 guns.

Salvador. Anciently called Cuscatlan; smallest but most densely populated republic in America. Area 7,255 sq. m. The surface is high and mountainous, except a narrow strip along the Pacific: many of the mountains are volcanoes. The province was conquered for Spain by Alvaredo 1528. It became

Cathedral of San Miguel, San Salvador.

independent 1821; belonged to the Central American Confederacy 1823–39; and since 1853 has been an independent state. The country is greatly subject to earthquakes, and one volcano has been in constant activity for more than 100 years. Pop. ab. 800,000. San Salvador, the capital, has been repeatedly laid in ruins, the last time in 1873. In 1895 Nicaragua, Honduras and S. formed the Central American Union, which was joined by Costa Rica and Guatemala in 1897. Pop. ab. 25,000.

Salvadoraceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 3 genera and ab. 7 species, natives of the tropical and adjacent warm regions of e. Asia and of Africa; allied to the olive.

Salvage. Compensation, generally given by law, though sometimes agreed upon, for the saving of persons or property from sea perils. It is a lien on all the property benefited by the service, and is apportioned among claimants in proportion to the risk and responsibility borne by them.

Salvandy, NARCISSE ACHILLE, COMTE DE, 1796–1856. French historian of Poland 1827–29; Minister of Instruction 1837–39 and 1845–48; Envoy to Spain 1841–43, and to Piedmont 1843–45.

Salvatierra, JUAN MARIA DE, 1648–1717. Italian missionary to Mexico; apostle and historian (1698–99) of California; Provincial of the Jesuits 1704–7.

Salvation Army. Organized under this name 1878 by WILLIAM BOOTH (q.v.); outgrowth of a work begun 1865 in London, and called the Christian Mission 1869. Its labors have extended from England to all parts of the world, and have been efficient in aiding and reforming many whom the churches could not reach. Disregarding the conventional methods and employing a military system, street meetings, and plain and unprecedented means of attracting audiences, it has endured and surmounted much obloquy. It has some 11,000 officers, half of them women, with many corps and outposts, and circulates a multitude of papers and books. The founder and his sons direct its movements, and have outlined and attempted a gigantic philanthropic enterprise: see *In Darkest England*, 1890, and *Life of Catherine Booth*, 1893. Mr. and Mrs. Booth-Tucker, as commander and consul respectively, have had command in the U. S. since 1896. Mr. and Mrs. Ballington Booth, formerly in command, have been at the head of the Volunteers of America, a similar organization, since 1896.

Salvator Rosa. See ROSA.

Salvelinus. Genus of *Salmonidæ*, including fishes known as Char in England and Trout in e. U. S. (The true Trout is confined w. of the Plains.) This genus is characterized by a deep vomer armed only on the chevron with teeth, and with the shaft covered by skin. The spots are paler than the ground; besides, there are red spots, and the lower fins are edged with red. The scales are minute and hidden. *S. alpinus* of Europe is more graceful, shy, and slender than the American Char (*S. fontinalis*) or Brook Trout. The species most like the *S. alpinus* is *S. oquassa* of Rangeley Lakes, Me. The Brook Trout has no teeth on the vomer, and has large red spots on sides and black, mottled ones above. It spawns in Oct. and becomes mature at two years, when it is 6 in. long. In cold enough waters it may attain a weight of 10 lbs. The Great Lake (or Mackinaw) Trout has a strongly-toothed spur on the vomer. It attains a weight of from 20 to 80 lbs. It has no red spots; the dark ones are paler than the background.

Salverform. In Botany, corolla with a rotate or crateriform limb raised on a slender tube; also known as Hypocraterimorphous, or, erroneously, Hypocrateriform.

Salve Regina. One of the antiphons of Virgin Mary; appointed in the Roman Breviary to be sung from Trinity Sunday till Advent.

Salvi, GIAN. See SASSOFERRATO.

Salvianus, 5th cent. Of Marseilles; author of Latin treatises, pub. 1878, on Providence and against avarice.

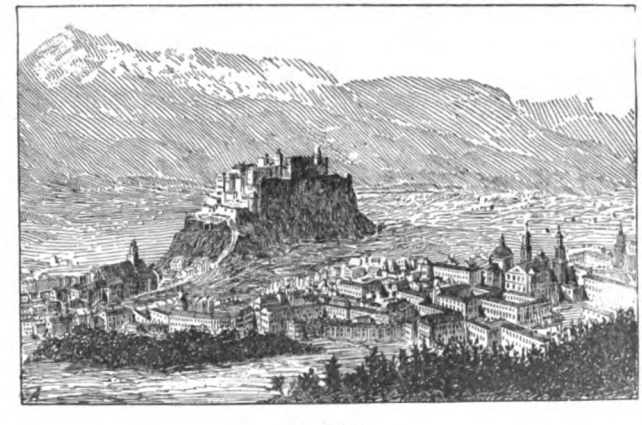
Salvini, TOMMASO, b.1830. Italian actor of high rank, eminent in Othello, Hamlet, Lear, Macbeth, Sommet's *Gladiator*, and other tragic parts: known in the U. S. 1873–74, 1881–82, and 1885–86; retired 1886.—His son, ALEXANDER, 1861–1896, followed in his footsteps.

Salviniaceæ. Order of *Rhizocarpeæ*, comprising the genera *Salvinia* and *Azolla*, small vascular cryptogams of aquatic habit.

Sal Volatile. Solution of carbonate of ammonia and alcohol, with a small amount of some volatile oil, as lemon or nutmeg, added. It is used as a smelling salt.

Salwen, or SALWEEN. River flowing s.e. across Thibet, and s. through British Burmah to Gulf of Martaban. Length ab.700 m.

Salzburg. Old city of w. Austria, on the Salzach, 80 m. e.s.e. of Munich; long governed by its archbishops, whose minor coinage is abundant. The city is old, with crooked



Salzburg.

streets and many fine edifices and monuments. It is surrounded by a wall, pierced by 20 gates. It was the birthplace of Mozart. Pop., 1891, 27,644.

Samana Bay. Bay 37 m. long and 12 m. wide, on e. end of San Domingo. It forms a fine harbor and is on the route from New York to the Isthmus of Panama. The U. S. Senate refused to ratify a treaty for its purchase in 1870.

Samaniego, FELIX MARIA, 1742–1809. Spanish poetic fabulist.

Samara. Indehiscent dry fruit, containing a single seed and expanded at one end or all around into a flat wing-like structure, as in Maples, Elms, and Ashes.

Samara. City of e. Russia, on the Volga, at its junction with the S. Pop., 1891, 99,856.

Samarang. Town on n. coast of Java, capital of a Dutch residency. Pop., 1890, 71,440.

Samaria. Central division of Palestine, between Galilee and Judæa.

Samaria. City of central Israel, on a hill, surrounded by higher hills, with a fruitful valley between; built by Omri, King of Israel, ab.922 B.C.; capital of the Northern Kingdom until its overthrow 721; taken by Alexander 332, and twice by his successors; destroyed by John Hyrcanus 109 B.C.; rebuilt by Herod as Sebaste; now a petty village.

Samaritan. Semitic dialect, closely related to the Hebrew, but much influenced by the Aramaic.

Samaritan Pentateuch. Recovered at Damascus ab. 1620; pub. 1631. It varies from the Hebrew MSS.

Samaritans. Later inhabitants of middle Palestine, mingled Israelites and Assyrians. They accepted the Pentateuch, but rejected the Prophets, and worshiped on Mt. Gerizim. Mortal hatred existed between them and the Jews. A small remnant is still left at Nablous or Shechem.

Samarium. One of the doubtful elements, found in samarskite by Lecoq de Boisbaudran 1879; at. wt. 150.

Samarkand. Town of Turkestan, 130 m. e. of Bokhara; anciently Marcanda, capital of Sogdiana; taken by Alexander 330 B.C., by the Arabs 712, by Genghis Khan 1219; capital of Tamerlane 1370; long a center of learning and art; held by Russia since 1868. Pop. ab.40,000.

Samaroid. Resembling a samara.

Samarow, G. See MEDING, OSCAR.

Samarskite. Heavy black mineral, containing the rare chemical elements niobium and tantalum, in combination with uranium, cerium, yttrium, iron, and other bases. Its principal localities are in the Ural Mts. and in w. N. Carolina.

Sambation. In Oriental Folk-lore, a river which flowed during the week but rested on the Sabbath.

Samian Earth. Terra samia, probably equivalent of the modern kaolinite. Samos was famed for its clay and the ware made from it.

Samian Letter. The Greek Υ, selected by Pythagoras (of Samos) to symbolize the two paths, of wisdom and of folly, familiar in the story of the youthful Hercules at the cross-roads.

Samisen. Japanese musical instrument introduced ab. 1560, consisting of a square drum having a long neck or finger-board with three silk strings which the player strikes with an ivory pecten.

Sammonicus, QUINTUS SERENUS, 3d cent. Latin versifier. *De Medicina.*

Samnite Wars. 1st., 343–341 B.C., ended by a treaty, the Samnites withdrawing from Campania; 2d., 327–304, issuing in a formal alliance with Rome. After the 3d, 298–290, the Samnites became allies of Rome on equal terms.

Samnite Warrior.

Samnium. District of ancient Italy, n. of Campania. The Samnites were of Sabine stock, brave and independent; were long at war with Rome. Defeated by Sulla at the gates of Rome in 82, their towns were laid waste and the inhabitants sold as slaves.

Samoa (formerly NAVIGATORS' ISLANDS). Group, mainly volcanic, in the s. Pacific, with a total area of 1,700 sq. m., and a pop. of ab.35,000; discovered 1722, explored 1768, visited by missionaries 1830. Its independence is guaranteed by the U. S., Germany, and England. The king is chosen by popular vote; the Supreme Court is presided over by an American.

Samoans. Pure Polynesian tribe, regarded as the center from which this race spread. They are lighter than Chinese, athletic, with straight, almost blue-black hair and prominent noses. They use spears set with fish bones, and build oval houses without windows. Marriage ties are held lightly. Many are Christianized.

Samos. Island in the Ægean, s.w. from Ephesus; area 289 sq. m. It sent out many colonies; reached its height of splendor under Polycrates 532 B.C.; came under Persia, but regained its independence at the battle of Mycale 479; was conquered by Athens 440; changed masters frequently in the next 300 years, and was made a free state by Octavianus. Pop., 1889, 43,901.

Samothrace. Island in n.e. Ægean, anciently devoted to the Cabeiri; scene of Turkish massacres 1457 and 1821; devastated by an earthquake 1893. It yields some remains of antiquity, and bore a part in Greek legends. Area ab. 40 sq. m., pop. ab. 2,000.

Samoyeds. One of the five divisions of the Turanian family, in n.w. Siberia and n.e. Russia, numbering ab.22,000. In summer they live on the coast, but migrate to the forests in winter. Their Shamans torture reindeer to cure diseases in man, and if the patient recovers the animal is buried alive, that the evil spirit, which is supposed to have left the man and entered the animal, may not return. Images of the dead are offered food. The females are slaves, and can be sold by their male relatives. Suicide is regarded as pleasing to the gods. They are the relic of a race formerly more widely spread and semi-civilized. It has been thought that they inhabited w. and s. Europe in the Reindeer epoch.

Samoyed Sleigh.

Samphire. *Crithmum maritinum.* Fleshy-leaved herb of the Carrot family, occurring on the sea-shores of Europe.

Samphire, FALSE. See GLASSWORT.

Sampson, DEBORAH, 1760–1827. Mass. Amazon, who served 3 years in the Continental army.

Sampson, WILLIAM, 1764–1836. Irish-American lawyer and polemic writer. *Memoirs,* 1807; *Hist. Law,* 1826.

Sampler. Specimen of needlework executed by beginners, usually embroidered on coarse cloth, canvas or cardboard, and often including religious emblems, alphabets, and the name of the maker.

Samson. Last of the 12 judges of Israel; eminent for physical strength. His curious story is told in Judges xiii.–xvi.

Samson, GEORGE WHITEFIELD, D.D., 1819–1896. Pres. Columbian Coll., Washington, 1859–71; prolific writer.

Samson Post. Heavy post that supports the walking beam in the rig for drilling oil-wells.

Samuel. Judge of Israel, through whom the monarchy was introduced. He supported David against Saul, and was the founder of the Prophetic Order.

Samuel, BOOKS OF. 9th and 10th of O.T.; of unknown authorship and date. They relate the history of Samuel and David.

Samurai. Military class in Japan, formerly ranked separately, now included with the petty nobility, in the Shizoku, or second of three grades of the population.

Samydaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons,* comprising 20 genera and ab.180 species, growing in the tropical regions of the Old and New Worlds.

San'ai, ABULMAJD MAJDUD BEN ADAM, 11th cent. Persian Sufic poet.

San Antonio. Capital of Bexar co., Texas, on the S. A.; founded 1714. It has some manufactures, and a large trade in cotton, cattle, and hides. At the Alamo, then a fort, Santa Anna slew 188 Americans 1836. Pop., 1890, 37,673.

San Antonio River. Heading in s.e. Texas and flowing s.e. to the Gulf of Mexico. Drainage area 16,352 sq. m., length 200 m.

Sanballat. Moabite, who strove to hinder the rebuilding of the walls of Jerusalem 445 B.C. (Neh. iv. 2).

San Benito. Garment worn in Spain by the condemned before and at an auto-da-fé.

San Bernardino Mts. In s. Cal., between Mojave and Soda Lake deserts. Elevation 6,970 ft.

San Blas, BAY OF. On the n. side of the Isthmus of Pan ama, in 79° W. long.

San Blas, CAPE. On s. shore of Florida.

Sanborn, FRANKLIN BENJAMIN, b. 1831. American reformer and journalist, biographer of Thoreau 1882, and John Brown 1885.

Sanborn, JOHN BENJAMIN, b. 1826. Brig.-gen. U.S. Vols. 1863, serving in the West.

Sanchez, AFFONSO, ab.1430–ab.1486. Portuguese seaman, traditional discoverer of the Amazon and some of the W. Indies, whose papers guided Columbus.

Sanchez, THOMAS, 1550–1610. Spanish Jesuit, whose *De Sacramento Matrimonii*, 1592, was attacked by Voltaire.

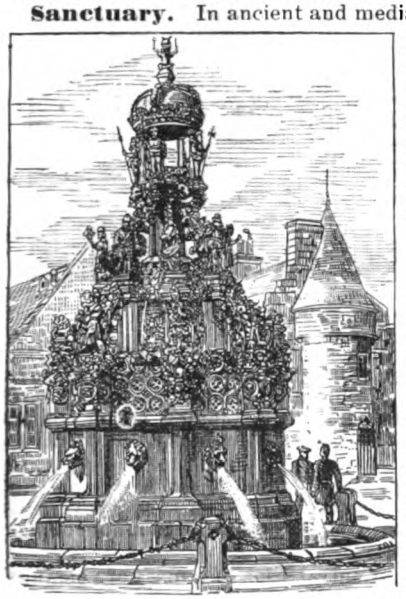
Sanchuniathon. Phœnician writer, before the Trojan war. Fragments are found in Eusebius, the trustworthiness of which has been much debated.

Sancroft, WILLIAM, D.D., 1616–1693. Dean of St. Paul's 1664, Archdeacon of Canterbury 1668, Abp. 1677. He headed the 7 bishops who were tried and acquitted 1688 for resisting the tyranny of James II., and was deprived as nonjuror 1691.

Sanctification. Production of holiness in a believer's heart; regarded in Protestant theology as subsequent to justification.

Sanction, IN ETHICS. Body of recompenses and punishments attached to the execution or violation of any law.

Sanctuary. In ancient and mediæval times, refuge found in consecrated places by those pursued by the law or by private vengeance; or the places, as the Jewish Cities of Refuge, and Holyrood Abbey in Scotland.—In a church, the eastern part of the choir, containing the altar; also called the presbytery.



Sanctuary at Holyrood Palace, Edinburgh.

Sanctus. Portion of the Mass immediately preceding the consecration of the Host. In the Prayer Book it has a nearly similar position.

Sand. Aggregation of loose, uncompacted, mineral grains, usually of rounded form, derived from the wear of the older rocks. In common sand the grains are almost always quartz. Sandy soils are easily worked, but are often lacking in fertility and easily depleted of what they have, besides being quickly affected by droughts.

Sand, GEORGE. See DUDEVANT, MME.

Sandal-Wood. *Santalum album.* Small tree of the natural family *Santalaceæ*, native of India. Its fragrant wood is used as incense, as is that of several other trees of the same region.

Sandarac. Name given to REALGAR (q.v.).

Sandarach. Resin derived from the coniferous tree *Callitris quadrivalvis*, native of n. Africa; known as Arar. It is used in incense and varnishes.

Sand Augur. Augur inclosed in a cylindrical tube, by which holes may be sunk in soil or sand; used by engineers to ascertain the character of the earth under a proposed foundation.

Sand Bags. Canvas bags partially filled with sand, used in military operations.

Sand-Blast. Eroding process, in which the surface to be affected receives the impact of a jet of dry steam in which sand is suspended. A quarter-inch orifice receives grains of sand from a lateral inlet, and the steam at a pressure of 80 lbs. or over imparts to them its velocity as they strike the work. If stencils be cut out in some material not affected by the sand, it is possible to etch patterns and inscriptions on the unprotected places; the process has also been applied to renew the cutting edges of files. Air-blast is also used. First applied by Benjamin C. Tilghman 1870.

Sandbox Tree. *Hura crepitans.* Large tree of the natural family *Euphorbiaceæ*, native of tropical America. At maturity its large ridged fruit bursts with a loud noise, scattering the seeds.

Sandby, PAUL, R.A., 1725–1809. English painter, chiefly in water-colors, and art teacher.

Sand Crack. Fissure in the hoof of a horse, occurring mostly on the inner quarters of the fore-feet and toes of the hind-feet. See QUARTER CRACK.

Sandeau, LEONARD SYLVAIN JULES. 1811–1883. French novelist and dramatist, Academician 1858. *Mariana*, 1839; *Mlle. de la Seiglière*, 1848. His stories are free from eroticism; his plays were mostly produced in partnership with E. Augier.

Sandemanians, or GLASSITES. Scottish sect, founded ab. 1728 by John Glas, 1695–1773, and in London, 1760, and New England, 1764, by his son-in-law, Robert Sandeman, 1718–1771. It was never extensive, and has now but a few congregations. Its *Christian Songs*, 1749–94, had much devotional and poetic beauty. Faraday, the chemist, was a member.

Sanderling. Small snipe-like bird, gray and brown in color, with 3 toes, the hinder one being absent. *Calidris arenaria* has white belly, is variegated rusty and dusky white above. Length 8 in. It feeds on worms in sandy beaches, accompanying Sandpipers.

Sanders, DANIEL, 1819–1897. German lexicographer. *Wörterbuch*, 1859–63.

Sanders, GEORGE NICHOLAS, 1812–1873. U. S. Consul at Liverpool 1853–57; Commissioner C.S.A. 1861–64.

Sanders, JAMES HARVEY, b. 1832. Ed. *Live Stock Journal* and *Breeders' Gazette* (Chicago). *Horse Breeding*, 1885; *Breeds of Live Stock*, 1886.

Sanderson, JOHN, 1783–1844. Biographer (in part) of the *Signers of the Declaration of Independence*, 1820; prof. Phila. High School from 1836. *Paris*, 1838.

Sanderson, JOHN BURDON, M.D., b. 1828. Prof. Physiology Univ. Coll., London, 1884, and Oxford 1892.

Sanderson, ROBERT, D.D., 1587–1663. King's chaplain 1631, prof. Oxford 1646–48, Bp. of Lincoln 1660. *Cases of Conscience*, 1628. *Works*, 6 vols., 1854.

Sanderson, SYBIL, b. 1864. American soprano singer.

Sand-Grouse (PTEROCLES). Eighteen species of beautiful pigeon-like Old World Grouse. They deposit their eggs in sand. *Syrrhaptes paradoxus*, an allied genus of e. Asia, has feathered tarsi and toes and longer pointed wings. In 1863 this species temporarily invaded Europe.

Sand-Grouse (*Pterocles exustus*).

Sand-Hog (ARCTOMYS COLLARIS). Fierce Badger of Hindustan, more bear-like in appearance than the ordinary Badger. It is yellowish white.

Sandhurst. City of Victoria, Australia, on Bendigo Creek, in a placer gold mining region, opened 1851. Pop., 1891, 37,238.

San Diego. Capital of S. D. co., Cal., on S. D. Bay, near the Mexican border; settled 1769 as a mission, 1867 as a town. Pop., 1890, 16,159.

Sandiford, RALPH, 1693–1733. Pa. Quaker, writer against slavery 1729.

Sand-Myrtle. *Dendrium buxifolium.* White-flowered, low shrub of the natural family *Ericaceæ*, native of the s.e. U. S.

San Domingo. See HAITI.

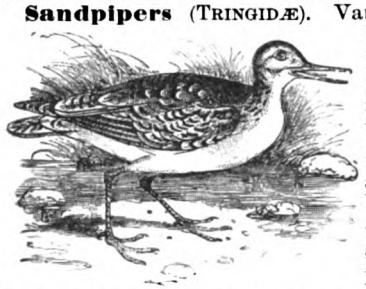
Sandoval, GONZALO DE, ab.1496–1528. Officer under Cortez, prominent in the conquest of Mexico.

Sandoval, PRUDENCIO DE, ab.1560–1621. Spanish historian of Charles V.

Sandoval Silva y Mendoza, GASPAR DE, COUNT DE GALVE, ab.1640–ab.1705. Viceroy of Mexico 1688–96; founder of Indian schools there.

Sand Paper. Abrading material made by coating paper with glue and dusting fine sand over it. Thin cloth is sometimes used instead of paper. It is intermediate between glass paper and emery paper in its action on metals, but less energetic than glass paper on wood.

Sandpipers (TRINGIDÆ). Various genera of snipe-like birds, but with eyes normally placed. During the breeding season they sing. In *Tringa maculata*, the Pectoral Sandpiper, the male expands his œsophagus with air during courtship and performs various antics before the female. There are numerous species; they go in flocks on sandy shores, looking for worms, etc., which are taken by probing with the delicate long bill.



Common Sandpiper (*Totanus hypoleucus*).

Sand Pump. Cylindrical shell of iron provided with a valve at the bottom and a bail at the top, used in removing from the bottom of a bore-hole the sludge and fragments of rock produced and accumulated in the process of drilling the hole; also called shell pump.

Sandrart, JOACHIM VON, 1606–1688. German painter, best known as a biographer of artists; active at Nuremberg.

Sandringham. House built 1869–71 for the Prince of Wales, in a park of 200 acres, in Norfolk, 3 m. from the North Sea.

Sandrocottus, or CHANDRA GUPTA. Founder of the Maurya or Magadha kingdom in the Ganges valley, n. India. He ruled at Patná (Palibothra) 316–292 B.C.

Sands, BENJAMIN FRANKLIN, U.S.N., 1811–1883. Captain 1862, serving chiefly on the Atlantic coast; Commodore 1866, Rear-admiral 1871; supt. U. S. Naval Observatory 1867–73.

Sands, HENRY BERTON, M.D., 1830–1888. Prof. of Anatomy in New York 1869–79, and of Surgery from 1879; professional writer.

Sands, JOSHUA RATOON, U.S.N., 1795–1883. Commander 1841; prominent in the Mexican war; Captain 1854, Commodore 1862, Rear-admiral 1866.

Sands, ROBERT CHARLES, 1799–1832. American writer in verse and prose. *Works*, 1834.

Sand-Snake. See COLUBRIFORMIA.

Sand-Spurrey. Low herbs of the genus *Tissa*, natural family *Caryophyllaceæ;* of wide geographical distribution, occurring mainly in saline soil.

Sandstone. Rock consisting of sand bound together by some natural cementing material. The individual grains are usually, though not exclusively, quartz, and are approximately uniform in size in any given rock. The coarser sandstones are called grit. The cementing material, which may be siliceous, calcareous, ferruginous, or earthy, has an important bearing on the value of the rock for structural uses. Next to limestone, sandstone is the most widely used building stone. The product in the U. S. in 1895 was valued at $4,211,314.

Sandusky. Capital of Erie co., Ohio, on the shore of S. Bay, an arm of Lake Erie. It has some manufactures, and exports fish, wine, and fruit. Pop., 1890, 18,471.

Sandwich, EDWARD MONTAGU, EARL OF, 1625–1672. English military and naval commander, Earl 1661, Envoy to Spain 1666–69.

Sandwich Islanders (KANAKAS OF HAWAII). Of mixed Polynesian stock, with brown complexions and well formed, healthy bodies; leprosy has been introduced by Chinese immigrants. The victims are confined to the island Molokai. Their native language resembles that of the New Zealand Maoris, but is harsher. They are hospitable, lack perseverance, are vain, ape their superiors in many trifles, but they prefer to eat sitting on the floor. All are Protestants by profession, though old superstitions still linger. When Capt. Cook was killed by the Kanakas 1776, they were addicted to cannibalism, and offered many human sacrifices. They have been decreasing at a rate of over 1,000 annually, and now number ab.40,000. Immorality is prevalent, though not so great as in pagan times: intemperance has increased.

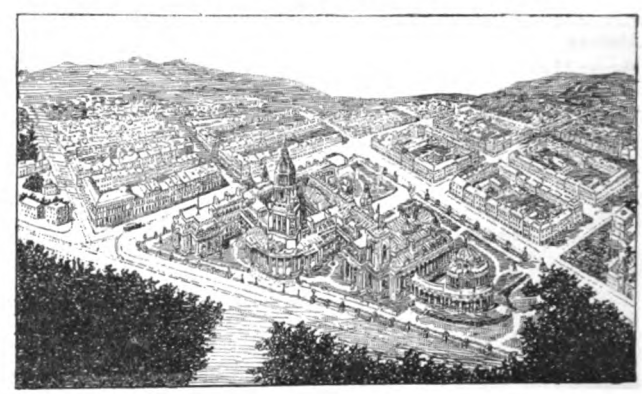
Sandwich Islands. See HAWAIIAN ISLANDS.

Sandwort. Low, white-flowered herbs of the genus *Arenaria*, natural family *Caryophyllaceæ*, of wide geographical distribution.

Sandy Hook. Narrow peninsula of Monmouth co., N. J., at entrance of New York harbor. Length ab. 6 m.

Sandys, GEORGE, 1577–1643. English poet; Treasurer of Va. 1621–24, where he built the first mill in America, and tr. the later books of Ovid's *Metamorphoses*, pub. 1626. His *Relation of a Journey* (in Turkey), 1615, is still valued; his *Paraphrase upon the Psalms*, 1637, contains some of the finest versions. Other paraphrases on the O. T. poems appeared 1638–42.—His brother, SIR EDWIN, 1561–1629, knighted 1603, pub. *Europa Speculum*, 1599, and *Sacred Hymns*, 1615, containing translations of 50 select Psalms.—Their father, EDWIN, D.D., 1519–1588, became Bp. of Worcester 1559, of London 1570, and Abp. of York 1576.

San Francisco. Largest and most important city and seaport of Cal.; on a sandy point which separates the s. part of S. F. Bay from the Pacific. It is rather irregularly laid out. Water is supplied by gravity. It has an extensive commerce and varied manufactures. It was first settled by Franciscan friars 1776. A town (Yerba Buena) was laid out 1836. A U. S. man-of-war took possession 1846; the name was changed 1847. It was incorporated 1850. It has a U. S. mint, and sends out several lines of ocean steamers. The shipping which comes to this port amounts to 1,100,000 tons annually. Pop., 1890, 298,997.



San Francisco—City Hall and Law Courts.

San Francisco Bay. Largest and finest harbor on the Pacific coast of the U. S. The entrance is narrow, but within it expands to an area of many square miles, with ample depth of water for the largest vessels.

San Francisco, MT. Central peak of a mass of volcanic mountains in n. Arizona. Altitude 12,562 ft.

Sanfuentes, SALVADOR, 1817–1860. Chilian poet, judge, and Minister of State.

Sangallo, GIULANO DI, 1443–1517. Florentine architect.

Sangaree. W. India beverage consisting of sugar, wine, water and nutmeg.

Sangha. Buddhist brotherhood, vowed to poverty and celibacy.

Sangir Islands. Ab. 50, between Celebes and the Philippines; partly volcanic. Area 323 sq. m., pop. ab. 80,000.

Sangreal. See HOLY GRAIL.

Sangre de Cristo Mts. Long narrow range of the Rocky Mt. system in Col. and New Mexico, e. of San Luis Valley. It contains many peaks exceeding 13,000 ft. in height, including Blanca Peak, the highest of the system, 14,464 ft.

Sangster, CHARLES, b. 1822. Canadian poet.

Sangster, MARGARET ELIZABETH (MUNSON), b. 1838, m. 1858. American poet: ed. Harper's *Young People* from 1882.

Sanhedrin. Highest Jewish council, composed of 71 rabbis or scribes, priests, and elders, sitting at Jerusalem. It condemned Jesus and persecuted the infant church. It appointed an inferior court of 23 members.

Sanicle. Herbs of the genus *Sanicula*, natural family *Umbelliferæ*, principally natives of the n. temperate zone.

Sanidine. Glassy variety of orthoclase feldspar, frequently found in trachyte and other acidic eruptive rocks.

Sanitarian. Person engaged in the investigation of the principles of public health and their application in practice.

Sanitary Commission, U. S. Organized 1861 to supplement the army medical dept. Its functions included the inspection of camps and hospitals, supply of medical and other stores, formation of convalescent camps, transportation and care of the wounded, and establishment of a bureau of vital statistics. It was supported by voluntary contributions, which at the close of the war had reached nearly $5,000,000, no account being taken of the sums raised and expended by the branches. Its contribution to the needs of the time has been computed at $25,000,000.

Sanitary Engineering. See SEWERAGE, DRAINAGE, HOUSE-DRAINAGE, and PLUMBING.

Sanitary Science. Application of the laws of health to the prevention of disease and the promotion of physical well-being in communities. It is sometimes called Public Hygiene and is included in State Medicine. See HEALTH, BOARDS OF.

San Jacinto, BATTLE OF. Fought April 21–22, 1836, on the S. J. River, Texas, between 1,536 Mexicans under Santa Anna and 783 Texans under Houston. It resulted in the defeat of the former and the independence of Texas.

San Joaquin River. Branch of the Sacramento, draining the s. half of the valley of California and the w. slopes of the s. Sierra. Length 350 m., drainage area 29,952 sq. m.

Sanjo Saneyoshi, 1836–1891. Prime Minister of Japan 1871–86, then Chancellor.

San José. Capital of Costa Rica; settled ab.1750. Pop. ab.20,000.

San José. Capital of Santa Clara co., Cal., 50 m. s.e. of San Francisco; founded 1782. It cans and ships large quantities of fruit. Pop., 1890, 18,060.

San Juan Mts. In s.w. Col.; group including 121 peaks above 13,000 ft. in height and 9 exceeding 14,000 ft.

San Juan River. Branch of the Colorado, flowing w., chiefly through n.w. New Mexico and s.e. Utah. Length 350 m.

Sankara. Hindu teacher, probably ab.800.

Sankey, IRA DAVID, b. 1840. Singing evangelist, associated with D. L. Moody from 1870.

Sankhya. Oldest system of Hindu philosophy.

San Lucas, CAPE. On s. coast of Lower California.

San Luis Park. In s. Col. and n. New Mexico. Elevation 7,000 to 8,000 ft. It is the largest of the Rocky Mt. parks.

San Luis Potosi. Capital of a State in Mexico; on the Santander. Pop., 1889, with suburbs, 62,573.

San Marino. Oldest of republics; in e. central Italy, 10 m. from the Adriatic. It consists of 5 villages; area 32 sq. m.,

San Marino.

pop. ab.8,000. It has been self-governing since ab.1300. Since 1847 it has been governed by a senate of 60 members, holding office for life, and 2 captains-regent, chosen for 6 months.

San Martin, JOSÉ. 1778–1850. Argentine general, liberator of Chili 1817–18 and Peru 1821; eminent for disinterestedness, reforming tendencies, and abstinence from civil war; in Europe from 1830.

San Martin, TOMAS DE, 1482–1554. Spanish missionary in San Domingo 1525–29, and Peru 1530; Dominican provincial 1540; Vice-gov. of Peru 1541; Bp. of La Plata 1551.

Sannazaro, JACOPO, 1458–1530. Neapolitan poet. *Arcadia,* 1502

Sanquhar Declaration. Put forth 1680 by Cameronians, renouncing allegiance to Charles II.

San Salvador. See SALVADOR.

Sans-Culottes. French lower classes ab.1793, who wore pantaloons, while the higher classes wore breeches; hence the name, at first opprobrious, but afterward accepted as a title of honor.

San Sebastian. Seaport of n. Spain, on Bay of Biscay; taken after heavy bombardment by the British and Allies under Wellington, Aug. 31, 1813.

Sanskrit. Oldest preserved form of Indo-European speech, with two forms: (1) Sanskrit of the Brahman priests, and of a rich and varied literature, but "for the last twenty-five centuries no longer a proper vernacular language" (Whitney); (2) Vedic, tongue of the Rig-Veda, written nearly 4,000 years ago. This language shows most primitive forms, and probably gives no very distant notion of the original Aryan or Indo-European.

Sanskrit Literature. Divided into two epochs: the ancient or Vedic, and the classical. The first comprises the four *Vedas*; *i.e.*, the *Rig-veda*, the *Sama-veda*, the *Yajur-veda*, and the *Atharva-veda*. The sacred texts with their commentaries inspired a literary development, which, in the second period, produced a vast literature, both in belles-lettres and in science. The *Ramayana* and the *Mahabharata* are the two great epics; the *Puranas* and *Tantras* are poems with theological purpose. The modern epics are the *Raghuvamsa* and the *Kumara-sambhava*, both attributed to Kalidasa, the *Nalodaya*, the *Kiratarjuniya*, the *Sisupala-badha*, the *Ravana-badha* and the *Naishadhiya*. The drama reached its height in Kalidasa ab.550. Lyric poetry is represented by numerous collections of songs, both erotic and religious. The *Hitopadesa* is the most important series of fables; others exist. Scientific literature covers a wide range of subjects, law and philosophy claiming the chief place, but medicine, astronomy, and mathematics are represented by many names.

Sanson. Family, who for many years gave Paris her executioners.

San Stefano, TREATY OF. Between Russia and Turkey, March 3, 1878; ending the Turko-Russian war. Its provisions were much modified by the Congress of Berlin a few months later.

Santa Anna, ANTONIO LOPEZ DE, 1795–1876. Mexican general 1821; prominent in overthrowing Iturbide 1822; leader of several revolts; Pres. or Dictator 1833, 1835–36, 1841–44, 1846–47,

Santa Anna.

and 1853–55; invader of Texas 1836, author of the massacre of the Alamo March 6, defeated and taken at San Jacinto April 22; defeated in sundry engagements 1846–47; in exile 1848–53, 1855–64, and 1865–67, ending a tortuous career with discredit.

Santa Barbara. City on s.w. coast of Cal., founded by Serra as a mission 1786; prominent as a health and pleasure resort. Pop., 1890, 5,864.

Santa Barbara Channel. Between the coast of Cal. and a series of islands, Santa Rosa, San Miguel, and Santa Cruz.

Santa Claus. St. Nicholas in Dutch.

Santa Cruz, or ST. CROIX. One of the Virgin Is., W. Indies; discovered 1493 by Columbus; held by Denmark since 1733. Sugar and rum are the chief products. Area 83 sq. m., pop. ab.19,000.

Santa Cruz, ANDRES, 1792–1865. Pres. of Bolivia 1829–39; author of a confederation with Peru 1836–39; Minister to France 1848.

Santa Cruz, MARIA DE LAS MERCEDES, 1789–1852. Author in French and Spanish, b. in Cuba, resident mainly in Paris; Countess Merlin 1810. *La Havane*, 3 vols., 1842.

Santa Fé. Capital of S. F. co. and of New Mexico; in the valley of a small tributary to the Rio Grande, near the center of the Territory. It was founded by the Spaniards ab.1605, previously an Indian village. Pop., 1890, 6,185.

Santalaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 28 genera and 250 species, widely distributed throughout the tropical and temperate regions of the earth; called Sandal-wood family.

Santalin. $C_{15}H_{14}O_5$. Red crystalline acid, one of the important principles of sandal-wood and other red dye-woods; extracted from the wood with hot water.

Santa Maria, DOMINGO, 1825–1890. Pres. of Chili 1881–86.

Santa Maura. See LEUCADIA.

Santana, PEDRO, 1801–1864. Pres. of Dominica 1853–57 and 1858–61.

Santander. Seaport of Spain, on the Bay of Biscay; sacked by the French 1808. Pop. ab. 42,000.

Santander, FRANCISCO DE PAULA, 1792–1840. Vice-pres. of Colombia 1821–26, in authority during Bolivar's absence; banished 1828; Pres. of New Granada 1832–36.

Sant' Angelo, CASTLE OF. In Rome; circular structure, 72 ft. high and 220 ft. in diameter, resting on a square base whose sides measure 300 ft. It has suffered greatly from frequent attacks, and little of the original masonry is visible. It was constructed ab.550 from the Mausoleum of Hadrian, begun 135, which was covered with marble and ornamented with colonnades and statues.

Santarem, MANUEL FRANCISCO DE BARROS E SOUSA, VISCOUNT OF, 1791–1856. Portuguese official, in Paris from 1833. *Political Relations of Portugal*, 10 vols., 1836; *Cosmography of the Middle Ages*, 3 vols., 1849–52.

Santa Ritta Durâo, JOSE DA, 1737–1784. Portuguese poet, prof. Coimbra. His epic, *Caramurú*, 1781, deals with the early history of his native land, Brazil.

Santee River. In S. C.; formed by the Congaree and Wateree. It flows e. to the Atlantic. Drainage area 14,696 sq. m., length ab. 150 m.

Santerre, ANTOINE JOSEPH, 1752–1809. Parisian brewer, prominent in storming the Bastile 1789 and in the disorders of 1792; Commander of the National Guard 1792; Gen. of division; defeated by Vendeans Sept. 18, 1793.

Santi, GIOVANNI, 1435–1494. Mainly distinguished as the father of Raphael, but also a conscientious painter and court poet of Urbino.

Santiago. Capital of Chili, beautifully situated on the Maypocho, near the foot of the Andes and 68 m. s.e. of Valparaiso; founded 1541; repeatedly injured by earthquakes. Its university, opened 1842, has nearly 1,000 students. Pop. ab. 220,000.

Santiago de Compostella. James, son of Zebedee, as patron saint of Spain.

Santiago de Cuba. Seaport of s.e. Cuba. Pop. ab. 40,000.

Santillana, INIGO LOPEZ DE MENDOZA, MARQUIS OF, 1398–1458. Castilian poet, addicted to moralizing and allegory. His *Manual of Favorites*, 1453, is the earliest Spanish didactic poem. His *Centiloquia*, 1496, versified 100 proverbs.

Santley, CHARLES, b. 1834. English singer, prominent since 1857.

Santo Domingo. See HAITI.

Santonin. $C_{15}H_{18}O_3$. Active principle of wormseed; colorless crystals; mpt. 170° C.; prepared by treating the so-called seeds with lime-water.

Santorin, or THERA. One of the Cyclades, 70 m. n. of Crete; noted for prehistoric remains and volcanic eruptions, the last 1866–67. Thera on the n. coast is the capital. Excellent wine is grown on the volcanic soil. Area 29 sq. m., pop. ab.23,000.

Tomb of Cybele.

Sao Francisco. River of e. Brazil, rising in s.w. Minas Geraes and flowing n. and e. to the Atlantic; navigable for 150 m. Length ab.1,800 m., drainage area 250,000 sq. m.

Saone. River of e. France, rising in the Vosges and flowing s.e. and e. to the Rhone at Lyons. Length 282 m.

Sao Paulo. City of s. Brazil, 38 m. n.w. of Santos, its port; founded 1554; seat of an eminent law school. Pop. ab.75,000.

Sap. In sieges, a trench made for the purpose of approach.

Sap. Juices of plants. That which comes immediately from the roots is called Crude Sap: after passing through the chemical processes at work in the leaves it is called Elaborated Sap.

Sap Green. Pigment used in the manufacture of water-colors. It is obtained by boiling down the juice of buckthorn berries. It is not permanent.

Sapindaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab.100 genera and 950 species, distributed throughout the tropics and the regions bordering thereon; called the Soap-berry family.

Sapodilla. *Achras sapota.* Large tree of the natural family *Sapotaceæ*, native of tropical America, esteemed for its large, sweet fruit; also called Naseberry tree.

Sap of Timber. Water and watery matter contained in timber, particularly in the exterior layers near the bark. This should be evaporated by seasoning or other treatment, in order to prevent decay of the timber. See PRESERVATION OF WOOD.

Saponification. Process by which soap is formed by combining a fatty acid and an alkali; also, the resolution of ethers and analogous substances into alcohols and acids.

Saponin. $C_{32}H_{54}O_{18}$. White, amorphous powder, which provokes sneezing. Mixed with water, it forms a strong lather, and hence is added to syrups sold at soda-water fountains. It is found in the roots of *Saponaria officinalis*, quillaja bark, and horse-chestnut seeds.

Saponite. Soft, soap-like mineral; impure hydrous magnesium aluminium silicate, found in several parts of the earth as a product of the decomposition of rocks.

Sapor. See SHAPUR.

Saporta, GASTON, MARQUIS DE, 1823–1895. French palæobotanist; author of the monograph on the Jurassic Flora of France pub. in the *Palæontologie Française*, and numerous works on other French fossil floras, on fossil *Algæ*, and on the origin of trees cultivated for the use of man.

Sapotaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 38 genera and ab. 450 species, distributed throughout the tropics and the regions bordering thereon; called the Sapodilla family.

Sappan-Wood. *Cæsalpinia sappan.* Tree of the natural family *Leguminosæ*, native of the E. Indies. Its wood yields a red dye.

Sappers and Miners. Designation formerly applied to engineer troops, because of their being trained to construct approaches and parallels by means of the sap, in siege opera-

tions. In the U. S. army there is now a battalion of engineer troops of four companies, trained as sappers and miners, as well as in all other duties pertaining to engineer troops.

Sappey, MARIE PHILIBERT CONSTANT, b. 1810. Prof. Paris. *Anatomie descriptive*, 1847–63.

Sapphira. Wife of Ananias, and partner in his sin of lying and punishment (Acts v. 1–10).

Sapphire. Al_2O_3. Precious stone ranking with the diamond and ruby in value. The true sapphire is a blue, transparent variety of corundum, though mineralogically the term includes corundum of other colors as well. Among the ancients lapis lazuli was probably known as sapphire. The finest specimens are brought from India and the East, but stones of good quality have been found in Montana and elsewhere in the U. S.

Sapphire Quartz. Variety of quartz, in color deep blue.

Sapphirine. Magnesium aluminium silicate of pale blue color, found in Greenland; not valuable as a gem stone.

Sappho, ab.600 B.C. Greek lyric poet of Lesbos. The stories of her life and death are mainly mythical. Most of her work is lost, but enough remains to place her in the highest rank.

Sap-Pressure. Exerted by ascending sap on the tissues through which it flows, in young saplings sometimes equaling that of several atmospheres.

Saprolegnieæ. Order of minute *Fungi*, saprophytic on the dead bodies of animals and plants in water, or in a few cases parasitic on living fishes, as the Salmon disease and the spotting of Goldfish.

Saprophytes. Plants which live on the decaying bodies of other plants or animals, or on dead organic material to which they become attached, as many *Fungi*, the Indian Pipe (*Monotropa*), etc.

Sapsuckers (SPHYRAPICUS). Group of Woodpeckers, having tongues protrusible only a little way, the tip not barbed, but with a brush, and feeding on sap rather than insects,

Sapsucker (*Colaptes auratus*).

which are caught as food for the young. *Colaptes auratus*, the Golden-winged Woodpecker, or Yellow-hammer, destroys many insects. See WOODPECKER.

Sapucaia Nuts. See MONKEY POT.

Sapwood. See ALBURNUM.

Saraband. Saracenic dance, whose music, in slow time, has been used and developed by Bach and other composers.

Saracenic, MOHAMMEDAN, or ARABIAN ARCHITECTURE (q.v.). The architects of the Saracens were usually foreigners, and the Mosque of Touloun at Cairo, built 879, the first showing any originality, was designed by a Christian. The Arabian buildings of Cairo and the Moorish examples in Spain were derived from Persia and Byzantium, and were developed into the two corresponding types of the Saracenic art, the Arabian and the Moorish. Tombs and mosques are the chief buildings. The latter consist of an open space with a fountain, surrounded by colonnades, with a prayer niche and a pulpit, and a minaret at each corner; the founder's tomb was usually attached. The pointed arch, and dome elaborately decorated externally, the elaborate scroll work in place of a cornice, and the honeycomb work, connecting the square base with the circular dome, are peculiarities of this style. The windows were small, with bright-colored glass in elaborate patterns. The ceilings were richly painted and the walls and pavements were of marble mosaics and enameled earthenware tiles. The woodwork and bronze were delicately carved and wrought. The modern work of the successors of the Saracens is merely copied from their neighbors and has no claim to originality.

Saracens. Arabs who by 682 had subdued much of Asia, Africa and Europe. They conquered Spain 711, invaded France, and were defeated at Tours 732. Two caliphates, Bagdad (Abassides) and Cordova (Ommiades), divided their empire. Science and philosophy greatly flourished under their sway, and students were attracted from all Europe. They were overthrown by the Tartars 1258.

Saragossa. City of n.e. Spain, on the Ebro; founded from Carthage; Romanized as Cæsar Augusta 25 B.C.; taken by Goths 470, by Arabs 712, by Alfonso of Spain 1118; capital of Aragon till 1479; besieged 1808–9 by the French, who were fiercely resisted, with a loss of 60,000 lives; bombarded until entered by assault Jan. 27, 1809; defended street by street and house by house till Feb. 22, when it capitulated. Its university, founded 1474, has ab. 800 students. It has some manufactures and considerable trade. Pop. ab.93,000.

Leaning Tower of Saragossa.

Sarah, or SARAI. Wife of Abraham, mother of Isaac, and ancestress of Israel.

Saraiva, JOSÉ ANTONIO, b. 1823. Brazilian Minister of State, Premier 1880 and later.

Sarakhs. Village and fort of n.e. Persia, on the Heri-Rud; strategically important. Russia has had a post opposite since 1885.

Sarasate, PABLO MARTIN MELITON, b. 1844. Spanish violinist and composer.

Sarasvati. Word or Goddess of Wisdom of the Hindu pantheon, regarded as the daughter of Brahma, the Creator, who by incest with her gave birth to human kind.

Saratoff. City of e. Russia, on the Volga, 500 m. s.e. of Moscow. It has an extensive trade and considerable manufactures: its importance is of recent growth. Pop. ab.125,000.

Saratoga, BATTLE OF. Oct. 7, 1777; one of the most important and critical engagements of the American Revolution, resulting in the surrender of the British under Gen. Burgoyne Oct. 17. This victory restored the waning enthusiasm and confidence of the American people.

Saratoga Springs. Village of S. co., N. Y., 38 m. n. of Albany; noted for its mineral springs, which have long made it a place of extensive and fashionable resort. Pop., 1890, 11,975.

Sarawak. State of n.w. Borneo, governed by Sir James Brooke as Rajah 1842–68, and then by his nephew Sir Charles; British protectorate since 1888. Area ab.45,000 sq. m., pop. ab.300,000.

Sarbievski, CASIMIR, 1595–1660. Polish Latin poet, imitator of Horace.

Sarcenchyme. Modified collenchym of sponges, due to multiplication of minute granular cells throughout their substance.

Sarcina. See COCCUS BACTERIA.

Sarcobasis. Polycarpellary fruit whose carpels separate when ripe, as in many plants of the Spurge family.

Sarcocarp. Outer layer or exocarp of the pericarp or seed-vessel of plants, when it is soft and fleshy or pulpy.

Sarcocystidia. Sub-class of *Sporozoa*, including Gregarines that are parasitic in muscle-fibers. They are elongated, and produce many spores, from which falciform young escape.

Sarcode. Animal protoplasm; term introduced by Dujardin subsequent to the use of PROTOPLASM (q.v.) by von Mohl for the living matter of plant cells. Modern biologists, believing that the living matter of plants and of animals is fundamentally the same, have adopted the earlier term.

Sarcoderm. In Botany, fleshy seed-coat or fleshy layer in a seed-coat.

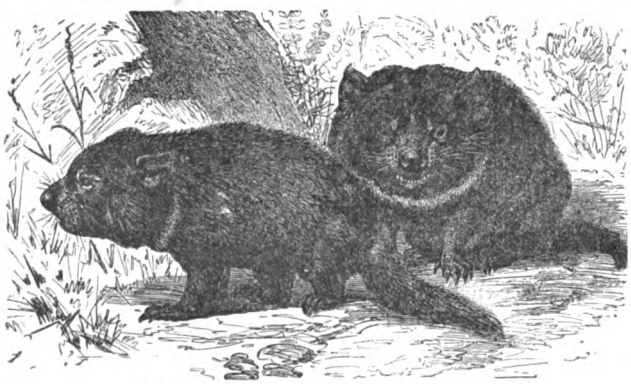
Sarcodina. See RHIZOPODA.

Sarcoids. See CHOANOCYTES.

Sarcolactic Acid. Acid of the same composition as LACTIC ACID (q.v.), occurring in muscular tissue and in blood after death, but not in living blood. It occurs with lactic acid as a product of fermentation and resembles it in its reactions.

Sarcoma. Several varieties of the graver forms of tumors, frequently malignant, and often confounded with cancer (carcinoma), especially by "Cancer-curers." Its minute structure has some resemblance to newly-formed flesh. An early and thorough removal offers the best chance for a cure.

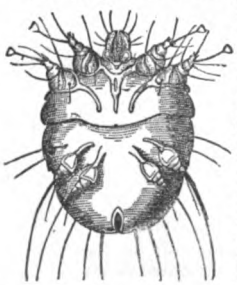
Sarcophaga (FLESH-EATERS). Group of polyprotodont Marsupials, including the Tasmanian Wolf, native Cats, Devils, etc., of Australia, representing different carnivorous forms analogous to the groups of *Carnivora* of the remainder of the world, not found in Australia. While the essential structure of these animals is Monotrematous, the appearance, habits, form of teeth, etc., mimic the *Carnivora* so closely that the groups and species run closely, though not absolutely, parallel with those of *Carnivora*.



Tasmanian Devil (*Sarcophilus ursinus*).

Sarcophagus. Large coffin of stone or any other material: primarily a limestone found in Assos, from which coffins were made and supposed to have the property of quickly destroying the corpse. The interior was often adorned with sacred texts.

Sarcoptes Scabei (ITCH-MITE). Species of the *Acarina*. They are small oval animals with two anterior pairs of five-jointed stumpy legs that end in stalked suckers, and two pairs of legs posteriorly, ending in bristles: in the male the last pair bear suckers. The back is beset with spines. The female produces the itch by burrowing in the skin, forming tunnels at the forward end of which she lies, having laid many eggs in the burrow behind her. These hatch rapidly and the young emerge and spread the disease to other parts and other persons. Repeated use of sulphur ointment will kill these parasites. They are $\frac{1}{100}$ to $\frac{1}{50}$ in. long. See ITCH.



Sarcoptes Scabei (*Sarcoptes hominis*).

Sarcosine. $C_3H_7NO_2$. Methylamidoacetic acid. Colorless prismatic crystals, soluble in hot water, formed by the action of boiling baryta water on creatine or caffeine.

Sard. Red translucent quartz, nearly or quite the same as carnelian.

Sardanapalus. Traditional last king of Assyria, noted for voluptuousness and effeminacy; said to have perished by fire with his wives and treasures when besieged in Nineveh by revolted subjects. He was probably Asshurbanipal, King of Assyria 668–626 B.C.

Sardine. See CLUPEIDÆ.

Sardinia. 1. Island in the Mediterranean, held by Carthage 512–238 B.C., then by Rome and various later powers, by Spain 1416–1713, by the House of Savoy from 1720, and now by Italy. Its industries are chiefly agricultural. Area 9,294 sq. m.; pop., 1893, 741,362. 2. Kingdom created 1720, including the island and most of n.w. Italy. See SAVOY.

Sardis. Capital of Lydia in w. Asia Minor; on the river Pactolus; rich and important in antiquity; repeatedly destroyed, as by Greeks 500 B.C., and by Tamerlane 1402.

Sardonic Smile. Convulsive contortion of the face, sometimes occurring in an attack of tetanus. The lips are separated, the angles of the mouth are drawn outward and upward, the alæ of the nose are elevated and expanded, the horrid mockery of a smile. The name is given because of the reputed power of a Sardinian plant to produce this contortion.

Sardonyx. Variety of onyx, in which one of the layers has the red color of sard or carnelian.

Sardou, VICTORIEN, b. 1831. French dramatist, since 1860 a master of stage requirements and effects, successful alike in satirical comedy and historical plays; Academician 1878. *Fedora*, *Théodora*, and *La Tosca*, 1883–84–87, and others, were acted by Sara Bernhardt. His *Thermidor*, 1891, was suppressed. *Gismonda*, 1894.

Sargasso Sea. Area of some 200,000 sq. m. in the s. central Atlantic, overspread by the green seaweed *Sargassum bacciferum*, or GULF-WEED (q.v.).

Sargasso Weed.

Sargent, AARON AUGUSTUS, 1827–1887. M.C. from Cal. 1861–73; framer of the first Pacific R.R. law 1861; U.S. Senator 1873–79; Minister to Germany 1882–84.

Sargent, CHARLES SPRAGUE, b. 1841. American naturalist. *Silva of North America*, 9 vols., 1891–97.

Sargent, EPES, 1813–1880. American journalist, poet, dramatist, and novelist. *Velasco*, 1837; *Life of Clay*, 1843; *Arctic Adventures*, 1857–60.

Sargent, JOHN SINGER, b. 1856. N. A. 1897. American portrait painter of high rank, much influenced by Velasquez; mainly active in Europe. A fine exhibit of his work was made at the World's Columbian Exposition, Chicago.

Sargent, WINTHROP, 1753–1820. Officer in the Revolutionary and Indian wars; Gov. of Northwest Territory 1798–1801, and of Miss. 1801.—His grandson, WINTHROP, 1825–1870, pub. *Life of André*, 1861, and *Les États Confédérés*, 1864.

Sargon, d. 705 B.C. Assyrian king from 722; conqueror of Israel, Babylonia, and Media; father of Sennacherib.

Sarmatia. Region between the Vistula and Volga, extending s. to the Danube and the Euxine; named from the Sarmati, but mostly peopled of old by Scythian tribes.

Sarmatians. Ancient race who spoke the Scythian language. They were nomads and roamed over the plains of e. Europe. The name is rhetorically used for Poland; also applied to the region in which the S. roamed.

Sarment. Elongated runner or long, prostrate, slender branch.

Sarmiento, DOMINGO FAUSTINO, 1811–1888. Pres. of Argentina 1868–74; prolific writer, eminent for services to education. *Vida de Abram Lincoln*, 1866.

Sarmiento de Sotomayor, GARCIA, COUNT DE SALVATIERRA, ab. 1590–1655. Viceroy of Mexico 1642, and of Peru 1648.

Sarmiento Gamboa, PEDRO DE, ab.1530–ab.1590. Spanish explorer of the Strait of Magellan 1579–80; founder, by royal order, of a short-lived colony there 1583; prisoner in England 1584–88. *Voyages*, tr. 1895.

Sarmiento Valladares, JOSÉ, COUNT DE MONTEZUMA, ab.1650–1717. Viceroy of Mexico 1696–1701.

Saros. Cycle of 6,585⅓ days, or 18 years 11 days approximately, required for the earth, sun and moon to return to the same position with respect to the moon's nodes. Eclipses of the sun and moon occur in the same order in each of these periods. This cycle was known to the Chaldeans, who employed it in predicting eclipses. In a single period there are usually 70 eclipses, 40 of the sun and 30 of the moon. The numbers will vary slightly, as the periods of the sun and moon, though nearly commensurable, are not strictly so. The following tabular statement will illustrate the periodicity, and show how a future occurrence may be predicted when once the order has been established by observation or otherwise:

Moon	1876	Sept. 3.4	Mag. 0.35	1894	Sept. 14.7	Mag. 0.23
Sun		Sept. 17.4	Total		Sept. 28.7	Total
Moon	1877	Feb. 27.3	Mag. 1.67	1895	Mar. 10.6	Mag. 1.63
Sun		Mar. 14.6	Partial		Mar. 26.0	Partial
Sun		Aug. 8.7	Partial		Aug. 20.0	Partial
Moon		Aug. 23.3	Mag. 1.76		Sept. 5.7	Mag. 1.56
Sun		Sept. 7.0	Partial		Sept. 18.4	Partial
Sun	1878	Feb. 1.8	Annular	1896	Feb. 13.2	Annular
Moon		Feb. 16.9	Mag. 0.84		Feb. 28.3	Mag. 0.87
Sun		July 29.4	Total		Aug. 8.7	Total
Moon		Aug. 12.5	Mag. 0.60		Aug. 22.8	Mag. 0.73

Sarpi, PIETRO (FRA PAOLO), 1552–1623. Venetian Servite monk; champion of Venice in her quarrel with the Pope; excommunicated 1607; enemy of Ultramontanism. His *History of the Council of Trent*, 1619, tr. 1629, was widely read. *Works*, 6 vols., 1677; 24 vols., 1789–90.

Sarraceniaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 3 genera and ab.10 species of marsh herbs with hollow leaves, all growing in America; called PITCHER-PLANTS (q.v.).

Sarsaparilla. Vines of the genus *Smilax*, natural family *Liliaceæ*, having thick aromatic roots, from which the drug parillin is extracted; mainly from tropical America. It is possessed of diuretic and diaphoretic properties, and at one time was considered a remedy for syphilis.

Sarsaparilla officinalis.

Sarsaparilla, WILD. Herbs of the genus *Aralia* of the Ginseng family, with aromatic roots and foliage, of wide distribution. Several species are natives of N. America.

Sarsfield. PATRICK, ab.1645–1693. Irish Jacobite, made Earl of Lucan 1689; defender of Limerick in two sieges 1690–91; in the French service; killed at Neerwinden.

Sartain, JOHN, 1808–1897. English-American engraver, in Phila. from 1830; introducer of mezzotints; conductor of *Sartain's Magazine*, 1848–52.—His son WILLIAM, b. 1843, is a painter in New York.

Sarti, GIUSEPPE, 1729–1802. Italian operatic composer. *Armida*, 1786.

Sarto, ANDREA DEL, 1487–1531. Florentine painter, supereminent as a colorist. His best work is the beautiful frescoes in the court of Santa Annunziata at Florence. His altar pieces and Madonnas tend to sameness, but are excellent works.

Sartoris, ADELAIDE. See KEMBLE.

Sartwell, HENRY PARKER, 1792–1867. American botanist. *Carices*, 1848.

Sarum. See SALISBURY.

Saskatchewan. Province of Canada, comprising a portion of the Great Plains, e. of the Rocky Mts. Area 101,092 sq. m. Prince Albert is the capital. Pop., 1891, 11,150.

Saskatchewan River. In Canada. It heads in the Rocky Mts. in two large branches, and empties into Lake Winnipeg. Length ab. 1,300 m., drainage area 482,000 sq. m.

Sassafras. Large N. American tree, *Sassafras sassafras*, of the Laurel family, the foliage and bark aromatic. In different countries numerous other trees are given the same name.

Sassafras (*Sassafras sassafras*): *a*, branch of male tree in flower; *b*, branch with ripe fruit and developed foliage.

Sassafras, OIL OF. Obtained by distillation from the roots of the sassafras and wintergreen. The oil consists chiefly of Safrol, $C_{10}H_{10}O_2$, and ab.10 per cent Pinine, $C_{10}H_{16}$.

Sassanidæ. Dynasty which governed Persia 226–651.

Sassari. Old town of n.w. Sardinia, 12 m. from Gulf of Asinara. Its university, founded 1677, has ab.125 students. Pop., 1893, 41,200.

Sassoferrato (GIOVANNI BATTISTA SALVI), 1605–1685. Italian painter of the decadence period. His works are mainly Madonnas, superficially attractive in some cases, but of no great worth.

Sassolite. $B_2O_3.3H_2O$. Native boric acid, found occasionally in the solid state, but more commonly in aqueous solutions, and especially in the hot waters of the lagoons of Tuscany.

Sassy-Bark. Poisonous bark of *Erythrophleum guineense*, found in Western and Central Africa; used as an ORDEAL (q.v.). It is a very poisonous narcotic.

Satan. Chief of the fallen angels; tempter of Eve; accuser of the saints; embodiment of evil; called in N.T. prince of the power of the air (Eph. ii. 2) and god of this world (II. Cor. iv. 4). He is more minutely represented in *Paradise Lost* than in the Scriptures.

Satellite. Small planet revolving round a larger one. See MARS, JUPITER, etc.

Satin. Silk stuff, first imported from China, which is distinguished by its very smooth, polished, and glossy surface.

Satinet. Coarse fabric of wool and cotton, but the name was originally given to a poor grade of satin.

Satin Spar. Variety of gypsum, possessing a fine fibrous structure and a silky luster; also sometimes fibrous varieties of calcite and aragonite; the latter are harder, and thus easily distinguished from the former.

Satin-Wood. *Chloroxylon swietenia.* Large tree of the Mahogany family, native of India; from which a fine-grained, lustrous wood is obtained.

Satire. Form of literature, whether in verse or prose, which deals with folly and vice. Its modes and tempers are as various as its applications; it may be light and easy, or tragically earnest: it may employ delicate irony or fierce denunciation: it may attack in its own name, or under cover of the dramatic (as with Aristophanes and Molière) or some other literary form. Among the most memorable satires are those of the Roman Juvenal and Persius, the German *Reynard the Fox*, Butler's *Hudibras*, Pope's *Dunciad*, and Lowell's *Biglow Papers*.

Satire Ménippée. Pub. 1594 in France, against the Catholic League; of composite authorship; in mingled verse and prose, after the manner of the Greek Menippus.

Satisfaction. Pleasure attending on the attainment of a desired object or the fulfillment of a recognized need.

Satolli, FRANCESCO, b.1841. Representative of the pope in U. S. 1895–96; Cardinal 1896.

Satow, ERNEST MASON, b. 1842. English interpreter in Japan 1861; Envoy to Siam 1886, Uruguay 1888, and Morocco 1893; author of a Japanese dictionary.

Satpura. High lands in n. India, ab.600 by 100 m. in extent; greatest altitude 4,454 ft.

Satraps. Governors of ancient Persian provinces; in remote regions, as Asia Minor, sometimes almost independent despots, which several of them became.

Saturated Solution. When a solvent has dissolved the maximum amount of a given substance, the solution is said to be saturated.

Saturated Steam. Steam whose temperature is exactly

that of the boiling point due to its pressure. If the temperature of such steam be lowered, some of it will condense to water or mist; if raised, the steam is superheated. Steam in contact with the hot water from which it has been made is always saturated, since, if the temperature of the steam be raised, it will evaporate more water and return at once to the condition of saturation.

Saturated Vapor. Partially condensed by diminution of volume or decrease of temperature. See VAPOR.

Saturation (MAGNETIC). When a magnetic field has attained to the maximum state of magnetization which is theoretically possible, it is said to be saturated. *E.g.*, the soft iron core of an electromagnet is magnetized to saturation if the number of Ampère-turns Si (the current strength i multiplied by the number of turns of wire S) is large enough. Toward the point of saturation, however, the magnetic susceptibility greatly decreases, and it has been found convenient in practice to define a Coefficient of Saturation σ to be the reciprocal of that number of ampere-turns that will bring the magnet up to such a degree of saturation that its permeability is halved. The point at which this state of things is reached is termed by Thompson the Dia-critical point of Saturation of the magnet.

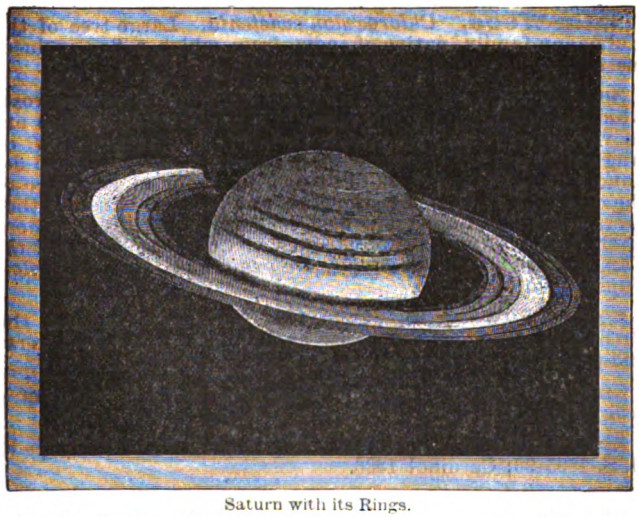
Saturation Point. Different magnetic substances, *e.g.*, iron and steel, differ from one another in the amount of magnetization they are capable of receiving. As the magnetizing force increases, the magnetization produced increases, at first rapidly and then more slowly. The point at which the effect ceases to increase is called the saturation point, and is a function of the magnetizing force. A sort of magnetic inertia appears to exist, which acts to resist magnetization at the outset and to retain it afterward. This action is called COERCIVE FORCE (q.v.), and is most strongly marked in the case of steel. It is not only more difficult to magnetize steel than iron, but the steel retains its magnetization permanently. The latter property Lamont has called Retentivity.

Saturation Pressure. See HYGROMETRY.

Saturday. Seventh or last day of the week; the Jewish Sabbath. Saturn's day.

Saturn. Mythical king, identified by the Romans with Cronos; supposed to have come to Italy in the golden age and taught agriculture, civilization, and morality. After death the god of agriculture. Hence Italy was called Saturnia by the poets.

Saturn. Sixth of the large planets in order of distance from the sun, 886,000,000 m.; diameter 71,000 m.; density 0.72 that of water; time of revolution about sun 29.46 years; revolution about axis 10h. 14m. 24 s.; gravity at surface 1.18 that of the earth. In the telescope the surface is diversified with



Saturn with its Rings.

belts like Jupiter, though much less conspicuous. The characteristic feature is the system of rings, so far not found elsewhere in the universe. The appearance is that of a thin plate of matter in the form of a ring surrounding the planet, coinciding in position with the plane of its equator. This was first seen by Galileo 1610, but its true character was first recognized by Huygens 1655. Close inspection shows this ring to be divided into three parts. The outside diameter is 168,000 m., internal diameter 95,000, breadth of rings 36,500 m. The thickness is small, 50 to 100 m. The inner one, called the gauze or crape ring, was discovered by W. C. Bond at Cambridge, Mass., Nov. 1850. The rings are probably formed of discrete solid particles like a swarm of meteors, or a cloud of dust, each moving like an independent satellite about the planet. There are eight satellites, as follows:

Name.	Discovery.	Distance from Saturn.	Time of revolution.	Diameter miles.
		Miles.	d. h. m. s	
Mimas	W. Herschel, 1789	117,000	0 22 37 5.7	600?
Enceladus	" "	157,000	1 8 53 6.9	800?
Tethys	J. D. Cassini, 1684	186,000	1 21 18 25.6	1,100?
Dione	" "	238,000	2 17 41 9.3	1,200?
Rhea	" 1672	332,000	4 12 25 11.6	1,500?
Titan	Huygens, 1655	771,000	15 22 41 23.2	3,500?
Hyperion	G. P. Bond, 1848	934,000	21 6 39 27.0	500?
Iapetus	J. D. Cassini, 1671	2,225,000	79 7 54 17.1	2,000?

Saturnalia. Festival in honor of Saturn, which began Dec. 17 and lasted originally 1 day, then 3, and finally 7 days; most remarkable season of freedom and festivity in the old Roman year.

Saturnian Verse. Oldest form of Latin meter.

Satyr Drama. In Greek Literature, a play in which the chorus was made up of satyrs. It held to the original character of the Dionysiac festival. Æschylus was the greatest master of the satyr drama, but Euripides' *Cyclops* is the only complete specimen extant.

Satyriasis. Name applied to two widely different forms of disease. 1. The true leprosy, elephantiasis Grecorum, because of the appearance of the patient: resembling a satyr. 2. The manifestation of morbid sexual desire in males; the complementary term is nymphomania, applied to females.

Satyrs. Spirits of the woodlands of Greek mythology, represented with pug noses, cloven hoofs, and ears like a goat; depicted as wanton, cunning, and cowardly, and considered as foes to mankind, whom they delighted to plague with roguish pranks. They stand for the luxuriant vital forces of nature, and are inseparably connected with the worship of Bacchus.

Sauces. Accompaniment to food, usually liquid or soft, highly seasoned, and used as a digestive or relish.

Sauerkraut. Red or white cabbage finely sliced and packed into a cask in layers, each layer being sprinkled with salt, and allowed to ferment. Sometimes juniper-berries, carraway or cumin seeds are added. It is eaten boiled.

Saul, d. ab.1055 B.C. First king of Israel; killed in battle with the Philistines, on Mount Gilboa.

Saul, OF TARSUS. See PAUL.

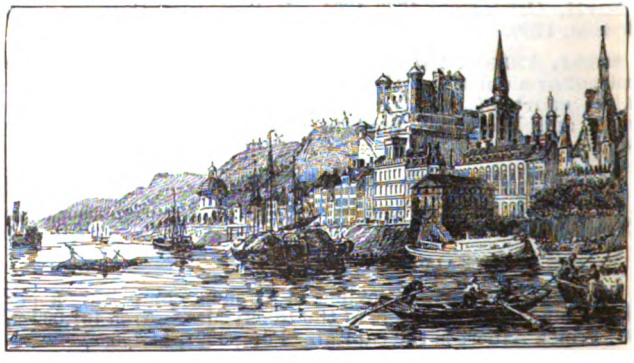
Saulcy, LOUIS FÉLICIEN JOSEPH CAIGNART DE, 1807–1880. French numismatist, antiquarian, and Orientalist.

Saulsbury, ELI, 1817–1893. U. S. Senator from Del. 1871–89, succeeding his brother, WILLARD, 1820–1892, who was Senator 1859–71, and Chancellor of Del. from 1873.

Sault Ste. Marie Canal. Ship canal, 1½ m. long, connecting Lakes Superior and Michigan, built 1855, enlarged 1870, and again 1894. It has the largest lock ever constructed, the length being 1,000 ft., width 100 ft., and lift 21 ft. The canal has marvelously increased the commerce on the great lakes. It is the greatest artificial waterway in the world, and passes far more vessels than the Suez Canal.—The town of the same name is on the canal and Lake Superior.

Saumarez, JAMES, R.N., 1757–1836. Commander 1781; knighted 1793; Vice-admiral and Baronet 1801; Admiral 1814; Baron 1831; distinguished in the wars with France, especially for a great victory near Cadiz, July 12, 1801, over a French and Spanish fleet.

Saumur. French town, on the Loire, 38 m. w. of Tours;



Saumur.

taken by the Vendeans 1793; noted for its Protestant Theol. Sem., 1598–1655, eminent in biblical criticism; also for its rosa-

ries made of cocoanut shells, and a white wine to which it has given its name. Pop., 1891, 12,825.

Saunders, FREDERICK, b. 1807 in London. Essayist and compiler; in Astor Library, New York, from 1859. *Salad for the Solitary*, 1853; *Salad for the Social*, 1856; *Evenings with Sacred Poets*, 1869–85.

Saunders, NICHOLAS, 1527–ab.1582. English R.C. theologian, prof. at Louvain 1566–79.

Saunders, ROMULUS MITCHELL, 1791–1867. M.C. 1821–27 and 1841–45; Attorney-gen. of N. C. 1828; Judge of N. C. Superior Court 1835–40 and 1851–65; U. S. Minister to Spain 1845–49.

Saunders, THOMAS WILLIAM, 1813–1890. English lawyer. Recorder of Bath 1860–78; prolific writer on law.

Saunderson, NICHOLAS, 1682–1739. Mathematician, blind from infancy; prof. Cambridge from 1711. *Algebra*, 1740; *Fluxions*, 1756.

Sauppe, HERMANN, 1809–1893. Prof. Zurich 1838–45, and Göttingen from 1856; editor of several classics; writer on Greek epigraphy.

Saurii, or LIZARDS. See LACERTILIA.

Saurin, JACQUES, 1677–1730. French Protestant, pastor in London 1701–5 and at the Hague; of notable eloquence. His *Sermons*, pub. in 12 vols., 1749, were tr. in 6 vols. 1775–76, and later.

Saurobatrachia. See URODELA.

Saurognathæ. See PICIDÆ.

Sauropsida (MONOCONDYLIA). Phylum of *Vertebrata*, characterized by the presence of one occipital condyle and oviparous reproduction. The quadrate bone is the suspensor of the lower jaw, and the third joint of the limbs falls between the proximal and distal mesopodials. There are two subphyla, REPTILIA and AVES (q.v.). See also CRANIOTA.

Sauropterygia. Group of extinct Reptiles, including Cretaceous fossils, of which the Old World PLESIOSAURUS (q.v.) and the New World Elasmosaurus are types. See also ENALIOSAURIA.

Saurornithes (SAURURÆ). Sub-class of Aves, including the Archæopteryx.

Saururæ. See ARCHÆOPTERYX.

Sausage Poison. Sausages in which certain alkaloids or PTOMAINS (q.v.) are developed by putrefaction. The symptoms are slow to appear and resemble poisoning by Belladonna. See TRICHINOSIS.

Saussure, HORACE BÉNÉDICT DE, 1740–1799. Swiss physicist, prof. Geneva 1762–86; well known for his original investigations into the nature of the strata, rocks, fossils, and minerals of the Alps. *Voyages dans les Alpes*, 4 vols., 1779–96; *L'Hygrometrie*, 1783.

Saussurite. Mineral related in composition to epidote and zoisite, first found near Lake Geneva. It is one of the constituents of the Alpine rock known as euphotide.

Savage, JAMES, LL.D., 1784–1873. American antiquarian. *First Settlers of New England*, 4 vols., 1860–64.

Savage, MINOT JUDSON, b.1841. Unitarian pastor in Boston 1874, in New York since 1896. *Religion of Evolution*, 1876; *Poems*, 1882; *Social Problems*, 1886; *My Creed*, 1887; *Evolution of Christianity*, 1892.

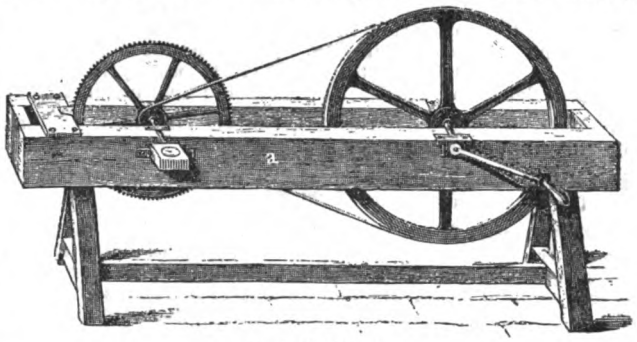
Savage, RICHARD, 1698–1743. English poet, memorable less for his works than for his misfortunes, recounted by Dr. Johnson. *The Bastard*, 1728; *The Wanderer*, 1729.

Savannah. Capital of Chatham co., Ga., on the S., 18 m. from the sea; founded 1733; taken by the English Dec. 29, 1778, after stout resistance; besieged by French and Americans in fall of 1779, bombarded Oct. 4–9, and unsuccessfully assaulted Oct. 9; taken by Sherman Dec. 21, 1864. It has an excellent harbor and a large commerce, chiefly in cotton shipments. Pop., 1890, 43,189, one-half colored.

Savannah River. Boundary between S. C. and Ga.; navigable to Augusta, Ga. Drainage area 11,402 sq. m., length 450 m.

Savart, FÉLIX, 1791–1841. Prof. Paris 1838. French physicist, in the branch of acoustics.

Savart's Wheel. Contrivance for determining the pitch of a musical note. It consists of a toothed wheel, capable of being turned rapidly by a multiplying arrangement, against the teeth of which a thin elastic card or plate may be placed. By knowing the number of turns per second and the number



Savart's Wheel.

of teeth in the wheel, the pitch of the note emitted by the card may be determined.

Savary, ANNE JEAN MARIE RENÉ, 1774–1833. French General 1803; victorious at Ostrolenka Feb. 16, 1807; Duke of Rovigo 1808; Napoleon's agent in Spain 1808; Minister of Police 1810–14; Commander in Algeria 1831.

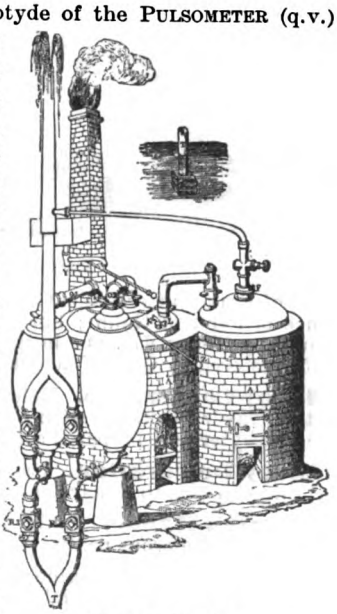
Savary, NICOLAS, 1750–1788. French traveler in the East. *Letters on Egypt*, 1781–85; tr. *Koran*, 1783.

Savate. Method of defense and attack in which the feet are employed, peculiar to France, where the sailors in the navy are regularly trained in this art; practiced as an amusement by boys in Corea, whence it may have been introduced.

Save. Branch of the Danube, rising in Carniola, flowing s.e. through Croatia, and forming the n. boundary of Bosnia and part of Servia. Length 660 m.

Savery, THOMAS, ab.1650–1715. English engineer, who invented the engine bearing his name.

Savery's Engine. Prototyde of the PULSOMETER (q.v.) for pumping water (see ENGINE, HISTORY OF); invented ab.1697. Steam from a boiler passed through a throttle-valve in a pipe to a vessel shaped like the air-chamber of a pump; by its pressure on the surface of the water in it, the water was forced through a valve into the rising main. The throttle being closed, steam was condensed in the chamber, whereupon a foot valve was opened and water from the well forced in by atmospheric pressure, to fill the chamber. Savery improved on this engine by doubling the chamber and connections, by which a continuous stream was maintained, as in the Pulsometer. His boiler had a safety-valve, gauge-cocks to test the level of water in it, and a feed-heater.



Savery's Engine.

Savi, GAETANO, 1769–1844. Prof. in Pisa. *Flora Pisana*, 1798; *Botanicon Etruscum*, 1808–25; *Observationes in varias trifoliorum species*, 1810; *Lezioni di botanica*, 1811; *Flora Italiana*, 1818–24; *Nuovi elementi di botanica*, 1820.

Savigny, FRIEDRICH KARL VON, 1779–1861. Prof. of Jurisprudence at Marburg 1803, and Berlin 1810; Minister of Justice 1842–48. *Geschichte des Römischen Rechts im Mittelalter*, 6 vols., 1815–31; *System des Heutigen Römischen Rechts*, 8 vols., 1840–49.

Savile, GEORGE. See HALIFAX, MARQUIS OF.

Savile, SIR HENRY, 1549–1622. Provost of Eton 1596; knighted 1604; founder of two chairs at Oxford; tr. Tacitus, 1581; ed. *Rerum Anglicanum Scriptores*, 1596, and Chrysostom's works, 1610–13.

Savin. See CEDAR.

Savings Banks. Philanthropic institutions organized for the safe deposit of small sums and the payment on these of a low rate of interest. The first was established in Germany 1765. In 1810 one was organized in Scotland. In 1817 acts

were passed to regulate these institutions in England and Ireland. In 1861 England introduced them in connection with the post-office; in 1892 these had increased to 10,519. Savings banks went into operation in New York, Phila., and Boston 1816–17, and in Baltimore in 1818. Total amount of deposits in 1880 (629 banks) $819,106,973; in 1895 (1,017 banks) $1,810,597,-023; no. of depositors 4,875,519 (W. Va. and Tex. not included).

Savioli, FREDOVICO VITTORIO, COUNT, 1729–1804. Italian poet, historian of Bologna.

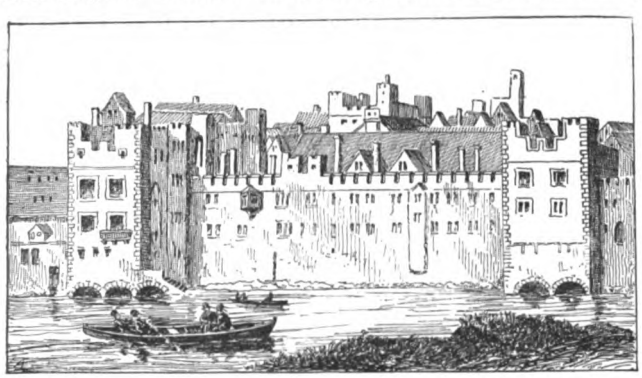
Savona. Old Italian seaport, 26 m. s. by w. of Genoa; noted for its pottery. Pop. ab.26,000.

Savonarola, GIROLAMO, 1452–1498. Dominican monk, at Florence from 1490; famous as preacher, patriot, and reformer, attacking the corruptions of the Church, not its doctrines. His zeal aroused powerful enemies, who procured his imprisonment. Claiming prophetic powers and a divine mission, he appealed to the ordeal of fire. His influence and popularity, long enormous, vanished, and he was strangled and burned. *Works*, 6 vols., 1633–40; *Triumph of the Cross*, tr. 1868. George Eliot celebrated him in *Romola*.

Savory. *Sutureia hortensis.* Aromatic herb of the Mint family, native of Europe; cultivated in gardens and locally escaped into waste places in N. America.

Savoy. Former province of n.w. Italy, ceded to France 1860; made a duchy 1416. Since 1720 the kings of Sardinia, and since 1861 those of Italy, have belonged to the House of Savoy.

Savoy. In London; formerly a palace, now a chapel royal; near the Thames. The grant was made 1246 to Peter of Savoy, uncle of Queen Eleanor. It was the prison of the captive King



The Savoy in 1650.

John of France after the battle of Poitiers, afterward the residence of John of Gaunt; burned in Wat Tyler's revolt 1381, rebuilt by Henry VII. as a hospital 1505, a chapel royal added 1515; restored by Queen Victoria after the fire of 1864.

Savoy Conference. Held 1661 in London for the revision of the Prayer Book, but with no result. Baxter, representing the Presbyterians, prepared a *Reformed Liturgy*.

Savoy Declaration. Issued 1658 in London by Independent ministers, as to Congregational doctrine and polity.

Sawatch Range. In Col.; part of the Rocky Mt. system. It contains numerous peaks exceeding 14,000 ft. in height.

Sawdust. Small fragments made in sawing wood, which is used as a stuffing material for dolls and cushions, for sprinkling the floors in public houses, the arenas in amphitheaters, and in the manufacture of oxalic acid. The sawdust of mahogany and rosewood is used by furriers and that of cedar in making perfumery. Sawdust sinks in the water while the wood from which it is made floats.

Sawfly. Hymenopterous insects injurious to plants. The currant and gooseberry sawflies resemble caterpillars. See WHEAT SAWFLY, TURNIP FLY and WILLOW SAWFLY.

Saw-Mill. Machinery worked by steam or water power for cutting, molding or planing wood by means of saws; and for sawing stone, slate and marble. Wood-saw mills, driven by water, were erected as early as the 4th century in Germany, on the Roer River. Stone and marble mills had been used many centuries previously in Pontus, Caria and Rome. See SAWS, GANG-DRILL, CHANNELING MACHINE and CIRCULAR SAW.

Saws. Tools for cutting wood or metals by the successive impact of small cutting surfaces upon the edge of a thin plate. The saw differs from a file or a milling cutter, when driven by hand or power respectively, only by the greater breadth of the latter tools at the cutting surfaces. The teeth of saws will differ according as they are to cut with or across the grain of wood. Ripping or slitting saws to cut with the grain cut at the front of the teeth, which are cut steeper here than at the back; for cross-cutting, the teeth cut at their sides, each tooth being set over alternately to project beyond the plane of the plate. The breadth of the line cut into wood by a saw is called its kerf. In all cases this should be no wider than necessary, because the saw works slower to reduce more wood to dust, and because, in valuable woods, less finished lumber can be made from a given log. For hand use, the hand saws and the keyhole or compass or scroll saws are the usual types for woods: for metal, the hack-saw is used, a thin blade strained by a frame. For power use, the circular, band, and jig-saws are the usual types, all three forms being used for metal when with proper forms of tooth. For presenting work to power saws, special forms of table are used, and often the name covers both the saw and its table and accessories. When the circular saw mandrel is stationary, the table top rises and falls to vary the projection of the saw disk above it for rabbeting, and a carriage or fence secures that the cut is at the required angle, line, or bevel. Grooves can also be cut, either by having the saw inclined to its axis so as to wobble, or by passing the work over the saw obliquely. Sometimes the saw mandrel is adjustable, and either a ripping or cross-cut saw is made to protrude through the table. For heavy work, railway saws are used, which move forward across the work as they revolve. For band saws, the table is made up of narrow strips glued together to prevent warping, and with a metal plate where the blade passes to prevent excessive wear at that point. Many table-tops are arranged to tilt for sawing bevels. The special points are the guiding of the blade, resisting of the thrust at the cut, and maintenance of constant tension on the blade. See RE-SAW, JIG-SAW, and BAND-SAW.

Sawyer, LEICESTER AMBROSE, b. 1807. Pres. Central Coll., Ohio, 1840–47. Tr. N. T., 1858; tr. Prophets and Apocrypha, 1860–64.—His cousin, LORENZO, LL.D., 1820–1891, was Judge Cal. Supreme Court 1863–68, Chief-justice 1869–70, and U. S. Circuit Judge from 1870.

Sawyer, LEMUEL, 1777–1852. M.C. from N. C. 1807–13, 1817–23, and 1825–29; biographer of John Randolph, 1844.

Sawyer, PHILETUS, b. 1816. M.C. from Wis. 1865–75; U. S. Senator 1881–93.

Sawyer, SYLVANUS, b. 1822. Mass. inventor of improvements in chair-cane manufacture, and in projectiles.

Sawyer, THOMAS JEFFERSON, D.D., b. 1804. Prof. Tufts Coll. 1869; writer in defense of Universalism.

Saxe, JOHN GODFREY, LL.D., 1816–1887. American poet. His works, chiefly humorous, had a large circulation. *Clever Stories of Many Nations*, 1865.

Saxe, MAURICE, 1696–1750. Son of Augustus II. king of Poland; distinguished in arms in youth; Duke of Courland 1726–29; in the French service from 1730; Lieut.-gen. 1736. He took Prague by storm 1741; fought in Flanders 1744–48, winning brilliant victories at Fontenoy May 11, 1745, and at Rancoux Oct. 11, 1746; conquered all Belgium, taking its chief cities, and was made marshal 1746.

Saxe-Altenburg. German duchy; smallest of the Saxon states. As a member of the German Empire it has one vote in Council, and one representative in the Diet. Area 511 sq. m.; pop., 1890, 170,864.

Saxe-Coburg-Gotha. German duchy. The two once belonged to the great duchy of Saxony, fell to Ernestine branch of House of Wettin, and were united under Ernest III. 1826. They have one vote in Council and two members in the Diet. Area 755 sq. m.; pop., 1890, 206,513.

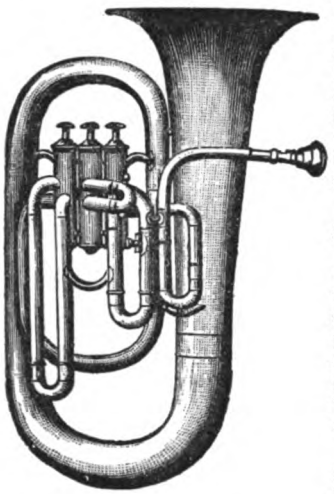
Saxe Holm. Anonymous author of tales of New England life; by some identified with Mrs. Helen (Hunt) Jackson.

Saxe-Meiningen. German duchy, ruled since 1681 by descendants of Ernest I. It has one vote in Council and two deputies in the Diet. Area 953 sq. m.; pop., 1890, 223,832.

Saxe-Weimar. German grandduchy; area 1,388 sq. m. The principalities of Weimar, Eisenach, and Gotha were founded 1640, and the former two were united under Ernest Augustus, 1728–48. He established the law of primogeniture. The reign of Karl August, 1775–1828, was made illustrious by the presence at his court of the most famous literary circle Germany has produced, and by his efforts in behalf of education. He joined the Rhenish Confederation 1807; at the Congress of Vienna he received accession of territory with title of Grandduke, and granted a liberal constitution 1816. The grandduchy took part with Prussia, 1866, and afterward entered the N. German Confederation. As a member of the Em-

pire it has one vote in Council, and elects three deputies to the Diet. Pop., 1890, 326,091.

Saxhorn. Family of brass instruments with valves, invented by Adolphe Sax, 1814–1894, Belgian, in Paris after 1842. All instruments of this family obtain power and facility somewhat at the expense of quality. Their chief use is in military music, the Euphonium and Bombardon only having held their own in the orchestra.



Euphonium.

Saxicolous. Plants which grow naturally upon rocks.

Saxifragaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 87 genera and ab.700 species, growing in the temperate and cold regions of the whole earth; called the Saxifrage family.

Saxifrage. Herbs of the genus *Saxifraga*, mainly with showy flowers, inhabiting rocky places, and of wide geographical distribution.

Saxifrage, GOLDEN. Low, marsh plants of the genus *Chrysosplenium*, of the Saxifrage family, natives of the cooler portions of the n. hemisphere.

Saxo Grammaticus, d. ab.1208. Danish author of a Latin history of Denmark, extending to 1185, and pub. 1514. The later part of it is of great value.

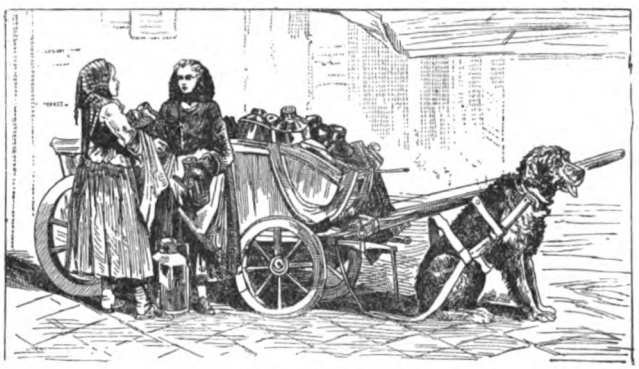
Saxon. See DUTCH LANGUAGE and GERMANIC LANGUAGE.

Saxon Architecture. The remains which have lasted to modern times of the buildings reared in Gt. Britain before the Roman conquest are inconsiderable, with the exception of Roman works. The existing specimens of these consist mainly of foundation walls, with a few arches of tile and rubble work. The inhabitants before the Roman conquest seem to have built exclusively of wood. Their essays in masonry were accordingly largely in crude imitation of the Roman examples. In some cases fragments of Roman moldings are imbedded in Saxon work. The Saxon building which remains is nearly all assigned to the 11th century. In the following century the Norman conquest had established itself and gave their architectural character to new buildings. The Saxon work done under Edward the Confessor is rude, and shows scarcely anything of ornament. The towers are covered with trellises of shallow pilasters, supposed to be imitated from timber-framing, and the angles are strengthened with a peculiar quoining called long and short work. A few real arches are assigned to this period, but they are unskillfully constructed, and in many cases the openings are covered with stones simply leaned against each other. The principal Saxon monuments are the tower at Earls Barton, in Northamptonshire, and Sompting in Sussex.

Saxons. Powerful German tribe, who dwelt in what is now Holstein. After the 3d century they headed a confederacy of German peoples, known as Saxons, and with the Angli conquered Britain ab.450.

Saxony. Kingdom of Germany, having great mineral resources and extensive manufactures; area 5,787 sq. m. The earliest inhabitants of Upper S., the Hermanduri, were succeeded by Slavs, afterward displaced by Germans. The Mark was bestowed 1090 on the House of Wettin. Under Henry the Illustrious, 1221–88, it became a powerful state; great roads were constructed, and Leipzig Fair established. After frequent partitions it was again united under Frederic the Warlike, 1381–1428. Ernest, 1464–86, founded the electoral line. His son, Frederic the Wise, 1486–1525, protected Luther. His nephew, John Frederic, was forced to abdicate, after the defeat of Mühlberg, in favor of Maurice, a member of the younger line. John George I. joined the Swedes in the 30 Years' War, but made separate peace with Austria 1635. S. was now at the height of its power. Frederic Augustus II., 1694–1733, was chosen King of Poland; his war with Charles XII. laid Poland waste, and exhausted S. Under Frederic Augustus III. the country was ravaged during the 7 Years' War. Frederic Christian (1763–1827) was forced to join the Rhenish Confederation, and most of his territory was added to Prussia. Antony, 1827–36, granted a constitution 1831. In 1866 S. sided with Austria and shared her defeat; on being admitted into the new Confederation, she resigned some rights, and paid a large indemnity. Capital, Dresden; pop., 1890, 3,502,684.

Saxony, LOWER and UPPER. Lower S. included nearly the whole region between the Elbe, the Harz Mts., the Rhine, and Friesland; it was made a dukedom 850. The son of Ludolf, the first duke, refused the crown of Germany, bestowed 919 on his son Henry, first of this dynasty. Otto I. gave S. to Hermann Billung 960, whose family held it till 1106, when Lothaire became duke. Being elected emperor, he gave S., now reaching to Pomerania, to Henry the Proud, Duke of Bavaria, under



Saxon Milk-Seller.

whose son, Henry the Lion, the vast domain, including L. and U. S., was divided 1180, only a small portion of it retaining the name. E. S. was given as an electorate to Bernhard of Ascania. In 1260 what remained of S. was divided into two parts, Saxe Lauenburg and Saxe Wittenberg. The electoral dignity was confirmed to the latter, by the Golden Bull. The Ascanian line failed 1422, and S. passed to Frederic the Warlike, ancestor of the reigning line.

Saxony, PRUSSIAN. Most westerly undetached portion of Prussia; most of it taken from the kingdom of Saxony and given to Prussia by the Congress of Vienna 1815.

Saxophone. Musical instrument, used chiefly in military bands, invented by Adolphe Sax. It resembles a clarionet, in having a single reed, but is made of metal and in many sizes. See SAXHORN.

Saxophone.

Saxton, JOSEPH, 1799–1873. Inventor, especially of appliances for the Mint and Coast Survey; in U. S. service from 1837.

Saxton, RUFUS, U.S.A., b. 1824. Brig.-gen. U. S. Vols. 1862–66.

Say, JEAN BAPTISTE, 1767–1832. Prof. Paris 1819; advocate of Adam Smith's doctrines. *Economie Politique*, 1803; *De l'Angleterre*, 1816; *Melanges*, 1833.—His grandson, JEAN BAPTISTE LÉON, 1826–1896, was Deputy 1871, thrice Finance Minister, Envoy to England 1880, and a writer on finance.

Say, THOMAS, 1787–1834. Zoölogist of Long's expedition to the Rocky Mts. 1819–20, and others. *American Entomology*, 1824–28; *Conchology*, 1830–34, repub. 1858–59.

Saybrook Platform. Regulative plan formed 1708 for Conn. Congregationalism, establishing a more rigorous interdependence of the churches than in Mass.

Sayce, ARCHIBALD HENRY, D.D., LL.D., b. 1846. O. T. reviser 1874; prof. Oxford 1876–90. *Assyrian Grammar*, 1872; *Comparative Philology*, 1874; *Science of Language*, 1880; *Ancient Empires of the East*, 1884; *Ancient Babylonians*, 1887; *Hittites*, 1888; *Records of the Past*, 6 vols., 1888–92; *Egypt of the Hebrews*, 1896.

Sayre, LEWIS ALBERT, M.D., b. 1820. Prof. of Orthopedic Surgery at Bellevue Hospital, New York, 1861; eminent as an operator. *Club-foot*, 1869; *Diseases of the Joints*, 1876; *Spinal Curvature*, 1877.

Sayre, ROBERT HEYSHAM, b. 1824. Chief engineer and supt. Lehigh Valley R.R. 1855–83; vice-pres. 1885.

Scab, OF SHEEP. Disease of the head due to minute parasites (*Sarcoptes*), which are oval, with 3 to 4 pairs of legs. They begin at the lips or eyes, where the skin is but slightly

hairy, and thence rapidly spread, causing eruptions and itching.

Scabies. See ITCH and SARCOPTES SCABEI.

Scabious. Showy-flowered herbs of the genus *Scabiosa*, natural family *Dipsaceæ*, comprising numerous species, all natives of the Old World; extensively cultivated for ornament.

Scabious.

Scabrous. Surfaces of organs or organisms rough with short projections or wrinkles.

Scævola, MUCIUS. Legendary hero, who saved Rome from Porsena by the loss or mutilation of his right hand. Others of this name were consuls 117 and 95 B.C.

Scagliola. Preparation of plaster of Paris with glue, to imitate marble; useful only for interior decoration.

Scala, DELLA. See VERONA, SCALIGER.

Scala, MASTINO DELLA, d. 1277. Ruler of Verona from 1260. His descendants retained power till 1387.—His son, CANGRANDE, 1332–1359, increased his domains, and was a patron of Dante.

Scalar, IN QUATERNIONS. Ratio between parallel vectors integral, fractional, or incommensurable, positive or negative but always real.

Scalariform. Ladder-like markings on the surfaces of certain prosenchyma cells.

Scalar Quantities. In Higher Algebra, those which follow in their combinations the laws of elementary (or arithmetical) algebra.

Scala Santa. Holy staircase in the Lateran, Rome, reputed to be the stairs of Pilate's house at Jerusalem, which Christ is said to have ascended.

Scald Head. Called also Ringworm of the Scalp. Popular names for a disease of the scalp forming rounded crusts. It is caused by the growth of a fungus and is known to dermatologists as Favus.

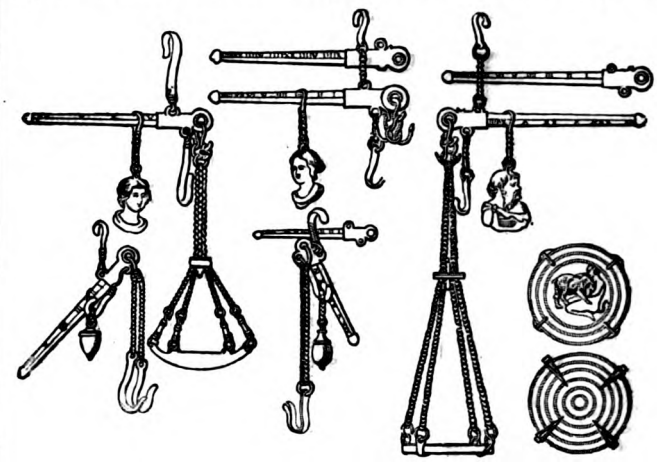
Scalds. See BURNS AND SCALDS.

Scale. Small, thin, modified leaves, as those which envelop the buds of most flowering plants, and those which subtend the simple flowers of grasses and sedges, and the florets of many plants of the Composite family.

Scale. Law of relation in a series of related quantities; uniform when unchanged throughout; arbitrary when it changes irregularly, either by usage or by subdivisions, and multiples of a standard, as in denominate numbers; variant when it changes according to some known law, as in difference series of second and higher orders.

Scale. In Music, (1) series of tones with definite relationships, upon which both melody and harmony rest, usually within the limits of an octave and named, from its key-note, a tonic. Scales are purely matters of convention, being based either upon the taste of different peoples, or on the theories upon which they construct their melodies. In European music the diatonic major scale is that having whole tones for all the intervals, except those between the third and fourth and seventh and eighth. The diatonic minor scale has the half tone between the second and third and fifth and sixth. The chromatic scale proceeds uniformly by half tones, as does the inharmonic scale, which employs the nomenclature of both sharps and flats; *e.g.*, the second tone of the scale in C is C-sharp, and also D-flat, the sound being identical upon keyed instruments with the tempered scale; (2) Compass of a musical instrument, and relative adjustment of the length, thickness, tension, etc., of a pianoforte's strings.

Scale. Weighing machines of some form or another have been in use from time immemorial. Pliny says they were invented by Phidon of Argos, or, according to Gellius, by Palamedes. Many centuries before, Abraham, 1860 B.C., weighed out 400 shekels of silver to Ephron the Hittite, as payment for a piece of land. The Romans placed their scales in the public



Scales from Pompeii.

market and recourse was had to them by buyers and sellers; this practice still prevails in modern Egypt. The weights were in the form of rings. See BALANCE.

Scale Insects. Many species of somewhat injurious plant lice. The adult males are winged; the females average $\frac{1}{10}$ in. in diameter. Shortly after hatching, they pierce the epidermis of the plant with their beaks and suck its juices, sitting motionless, meanwhile producing a batch of eggs which they cover; their bodies become transformed into a protecting case, covering them until they hatch. They have many natural enemies among other insects. If they are not checked naturally, whale oil soap may be applied in summer, kerosene emulsion when the young are newly hatched, and the trees washed in winter with strong lye.

Scalene Triangle. Having no two sides equal; distinguished from isosceles and equilateral.

Scales, ALFRED MOORE, b. 1827. M.C. 1857–59 and 1875–85; Brig.-gen. C.S.A. 1864; Gov. of N. C. 1885–89.

Scaliger, JULIUS CÆSAR, 1484–1558. Italian scholar and poet, physician in France from 1528; assailant of Erasmus.—His son, JOSEPH JUSTUS, 1540–1609, prof. Geneva 1572–74 and Leyden from 1593, was the most learned man of his age, if not of all ages: Niebuhr placed him "on the summit of real and universal knowledge." He edited several Latin poets, promoted the study of the classics, and by his *De emendatione Temporum*, 1583, and *Thesaurus Temporum*, 1606, rendered eminent service to chronology.

Scalops. See TALPIDÆ.

Scalp. Covering of the bones of the cranium, more particularly the skin on the top of the head on which the hair grows. It differs slightly from ordinary skin, having also the expanded tendon of the occipito-frontalis and intermediate cellular tissue and blood-vessels.

Scalpellum. Barnacle belonging to the group *Pedunculata*, in which the peduncle is not much developed. It has many strong plates in its shell, and is noted for the presence of COMPLEMENTAL MALES (q.v.).

Scamander. River of the Troad, flowing from Mt. Ida to the Hellespont; celebrated by Homer.

Scammell, ALEXANDER, ab. 1746–1781. Aide to Washington; prominent at Saratoga; mortally wounded at Yorktown.

Scammon, ELIAKIM PARKER, U.S.A., 1816–1894. Brig.-gen. U. S. Vols. 1862–65.—His brother, JONATHAN YOUNG, 1812–1890, founded Dearborn Observatory in Chicago, and the *Inter-Ocean*, 1872.

Scammony. *Convolvulus scammonia.* Perennial vine of the natural family *Convolvulaceæ*, native of Asia Minor; its large roots yield a purgative drug.

Scammony: *a*, portion of root.

Scamozzi, VINCENZO, 1552–1616. Italian architect. He finished the library of St. Mark's, built the Conaro Palace at Venice and the Trissino Palace at Vicenza.

Scandalum Magnatum. Libel or slander affecting a peer, judge, or high officer; defined by English statute 1275–1887.

Scandent. See CLIMBING.

Scandentia. See CARPOPHAGA.

Scanderbeg (GEORGE CASTRIOT), 1404–1468. Son of an Albanian chief; hostage to the Turks; favorite of Murad II., and general. Deserting 1443, he roused the Albanians, became their leader, won many victories, secured independence 1461, and again vanquished the Turks 1463–64. His successes were wholly personal; Albania was conquered 1477.

Scanderoon, or ALEXANDRETTA. Port of Aleppo; 30 m. n. of Antioch; founded 333 B.C. Near it an English naval victory was won 1628, and a Turkish force defeated by Mehemet Ali 1832. Pop. ab. 1500.

Scandinavia. Peninsula comprising Norway and Sweden; extended to include also n. part of Denmark.

Scandinavian Language. Northern group of Germanic languages, preserved in its earliest forms by loan-words in neighboring languages, and by runic inscriptions. Scandinavian or Old Norse is closely allied with the Gothic. Norwegian, Swedish and Danish became more or less independent dialects; in the 9th century Iceland was settled from w. Norway, and early Icelandic, often called Old Norse, developed the richest literature of all the Scandinavian tongues. Even in its modern form, Icelandic retains many primitive features. At present, Denmark and Norway have practically the same literary language, while Swedish presents decided differences from Danish. Dialects of Norway, however, still resemble the Icelandic and keep up the tradition of the Icelandic-Norwegian group.

Scandinavian Literature. See SCANDINAVIAN LANGUAGE, ICELANDIC LITERATURE, DANISH LITERATURE and NORWEGIAN LITERATURE.

Scandinavian Mythology. In this were recognized Odin, the principal god, and numerous gods and goddesses presiding over natural phenomena and human affairs; and their enemies the giants and giantesses, who were older and wiser, and accomplish the destruction of the world. The chief gods were worshiped by all the Teutonic races. The EDDAS (q.v.) of Iceland are the sources of information on this subject.

Scandium. Sc. At. wt. 44, sp. gr. 3.86, valence III.; discovered by Nilson 1879. It has not yet been obtained in a pure condition. It is a rare metal, found in gadolinite and euxenite. It forms a sulphate $Sc_2(SO_4)_3$ and an oxide Sc_2O_3. Its discovery was predicted by Mendeléeff.

Scandium Chloride. $ScCl_3$. Straw-colored, somewhat hygroscopic needles, converted into a basic chloride on heating; made by dissolving the oxide or hydroxide in hydrochloric acid.

Scandium Hydroxide. $Sc(OH)_3$?. White, gelatinous precipitate, obtained by heating scandium salts with ammonia; soluble in the common acids.

Scandium Nitrate. $Sc(NO_3)_3$. Small, fine, deliquescent columns, obtained by dissolving the oxide or hydroxide in nitric acid.

Scandium Oxide. Sc_2O_3. White, loose, infusible powder, obtained by heating the hydroxide or nitrate; soluble in boiling hydrochloric or nitric acids.

Scandium Sulphate. $Sc_2(SO_4)_3$. White, opaque substance, obtained by treating the nitrate with sulphuric acid and evaporating to dryness; soluble in water. It forms a double sulphate with potassium sulphate.

Scansores (CLIMBING BIRDS). Sub-class or order, characterized by having four toes of which the inner and outer are turned backward; some members can turn the outer toe both forward and backward. Otherwise there is much dissimilarity among the different forms. The beak is always strong; it may be straight or curved, small or large. The plumage is stiff, having little down. They are monogamous, live in forests, nest in hollow trees, and feed on insects, fruit, or seeds. Two orders are included: the *Picariæ*, with sub-orders *Cypseli*, *Cuculi*, and *Pici* (Humming Birds, Cuckoos, and Woodpeckers), and the *Psittaci* (Parrots). A part of the *Picariæ* are also placed with the Fissirostres and Levirostres as Passerine birds.

Scansoria. See ENTOMOPHAGA.

Scansorii. Walking legs of birds having two toes directed forward and two backward. Sometimes the outer toe can be turned either forward or backward, adapting it for climbing. See SCANSORES.

Scanzoni, FRIEDRICH WILHELM VON, 1821–1891. Prof. Würzburg 1850–88; writer on gynæcology. *Lehrbuch der Geburtshülfe*, 1849.

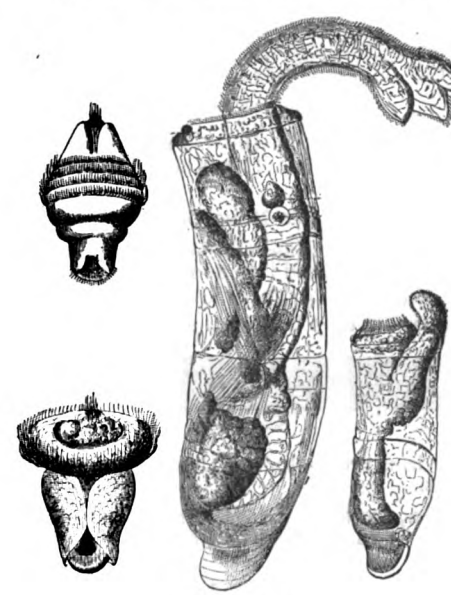
Scape. 1. Peduncle of a flower or flower-cluster which rises immediately from the ground, as in the Hyacinth and Cowslip, the true stem of such plants being subterranean. 2. Main stem of a feather.

Scapegoat. Goat over whose head, on the Day of Atonement, the Highpriest of Israel confessed the sins of the people, and sent it into the wilderness.

Scaphognathite. Plate-like scoop attached to the second maxillæ in crabs; used for paddling the water forward through the respiratory chamber.

Scaphoid Bone. See NAVICULAR.

Scaphopoda, or SIPHONODENTALIA. Diœcious *Mollusca*, without head, eyes, or heart, and with a trilobed foot and a



Scaphopoda.

tubular, calcareous shell, open at both ends. They live buried in the sand. The shell is bivalved in the embryo. The group includes the order *Solenoconchæ* and family *Dentalidæ*.

Scapolite. Group of minerals, including several varieties closely analogous to the feldspars in general chemical composition, being aluminium silicates with some calcium and sodium, though characteristically differing from the feldspars in the percentages of the several elements and in crystalline form. The most abundant variety is Wernerite.

Scapose. Plants which bear scapes; also stems resembling scapes.

Scapula. The shoulder blade, a flat triangular bone extending on either side down the back from the first to the eighth ribs. It articulates with the humerus and the clavicle and affords attachment to numerous muscles.

Scapular. Strip of serge worn over the shoulder by members of several R.C. orders.—Also, string with cross, picture of the Virgin, or other emblem; used by a society said to have been founded by S. Stock ab.1240.

Scapulars. Feathers on upper end of humerus of a bird's wing.

Engraved Scarab.

Scarab. Engraved stone in form of the scarabæus, one of the dung beetles, which was venerated by the Egyptians. They attached many mystical ideas to the living beetle, and employed the gem cut to represent it as an amulet.

Scaramouch. Comic braggart in old Italian plays.

Scarborough. Coast town of Yorkshire, prominent as a summer resort, 233 m. n. of London. It has saline and chalybeate springs. Its old castle was repeatedly taken in civil wars; it dates from 1136. It has a tidal harbor, with three piers. Pop., 1891, 33,776.

The Keep, Scarborough Castle.

Scarcity-Value. See MONOPOLY-VALUE.

Scarfing. In timbering mines or tunnels, style of jointing where one piece is notched into another.

Scarf Joint. Joint formed by notching two timbers in a zigzag manner and then bolting them together. When plates of timber or iron are bolted on the sides, it is called a scarf and fish joint.

Scarf Joint.

Scarfoglio, SIGNORA, b. 1856. Italian novelist, writing as "Matilde Serao"; ed. *Corriere di Napoli*, 1887. *Fantasy*, 1883, tr. 1891.

Scarious. In Botany, thin, dry, hyaline structures.

Scarlatina. See SCARLET FEVER.

Scarlatti, ALESSANDRO, 1649–1725. Italian musician, founder of the Neapolitan School; pupil of Carissimi; teacher of Logroscino, Durante, and Hasse. He wrote 200 masses, over 100 operas, and many oratorios, cantatas, motets, etc.—His son, DOMENICO, 1683–1757, Chapelmaster of St. Peter's, Rome, 1715–19, and for two years in London, wrote operas, but his fame rests on his compositions for the clavecin and his part in the development of the technique of keyed instruments.

Scarlet Fever. Infectious eruptive fever accompanied by soreness of the throat. The disease begins suddenly, the temperature being high from the first; the eruption appears on the second day (the disease is named from its color) and lasts for 5 or 6 days: desquamation usually begins by the 7th day. The communicating power of the disease begins with the eruption and is most active during the desquamation. Flakes of the skin clinging to articles of clothing may carry the disease for long distances, and the virulency is maintained for a long time after they have scaled from the patient. The infecting power of different outbreaks and individual cases vary very much. The patient should be isolated in a plainly furnished, well ventilated room, have a light diet with plenty of water to drink; physicians vary greatly in their suggestions of medicines. The attendants should not mingle with the other members of the household without previous disinfection. Every article coming from the sick-room should be disinfected, as also the room before it is used again. While the young are more susceptible, adults are not exempt; the second attack in the same person is rare. The mortality rate varies in different outbreaks, while those that recover are often afflicted for the rest of their lives. Many cases of deafness have their cause in an attack of scarlet fever. The specific germ of contagion has not been isolated.

Scarlet-Runner. *Phaseolus multiflorus.* Vine of the Bean family, native of Mexico, extensively cultivated as a garden vegetable.

Scarlett, SIR JAMES, 1769–1844. M.P. 1818; Atty.-gen. 1827; Baron Abinger and chief of King's Bench 1834.

Scarpa, ANTONIO, 1747–1832. Prof. Pavia 1783–1812; writer on anatomy.

Scarpanto. Italian name for the Turkish Kerpe, an island belonging to Turkey, midway between Rhodes and Crete, ab. 30 m. long and from 3 to 7 m. wide. Area 150 sq. m., pop. 8,000, mostly engaged in wood-working.

Scarron, PAUL, 1610–1660. French humorist, author of poems, comedies, satires, and tales. *Le Roman Comique*, 1651–57. He was a paralytic.—His widow, MME. DE MAINTENON (q.v.), became the wife of Louis XIV.

Schacht, HERMANN, 1814–1864. Prof. of Botany at Bonn. *Entwicklungsgeschichte des Pflanzen-Embryon*, 1850; *Das Mikroskop und seine Anwendung*, 1851; *Physiologische Botanik*, 1852; *Der Baum*, 1860; *Anatomie und Physiologie der Gewächse*, 1859.

Schack, ADOLF FRIEDRICH, GRAF VON, 1815–1894. German philosophic poet and Orientalist. *Memnon*, 1885.

Schadow, FRIEDERICH WILHELM, 1789–1862. German painter, director of the Düsseldorf Academy from 1826; allied with Cornelius and Overbeck.—His father, JOHANN GOTTFRIED, 1764–1850, long connected with the Berlin Academy of Arts, and from 1805 its head, was an eminent sculptor, as was his eldest son, RUDOLF, 1786–1822.

Schaeffer, CHARLES FREDERICK, D.D., 1807–1879. Prof. Gettysburg 1855–64, and Phila. Theol. Sem. from 1864; theological writer and translator.—His father, DAVID FREDERICK, D.D., 1787–1837, and cousin, CHARLES WILLIAM, D.D., LL.D., 1813–1896, were also prominent Lutheran divines.

Schaeffer, JAKOB CHRISTIAN, 1718–1790. German botanist. *Erleichterte, Arzneikräuterwissenschaft*, 1759; *Botanica expeditior*, 1760; *Fungorum qui in Bavariæ et Palatinatu nescuntur icones*, 1762–74.

Schafarik, PAUL JOSEPH, 1795–1861. Slavonic philologist and archæologist.

Schaff, PHILIP, D.D., LL.D., 1819–1893. Swiss-American scholar; prof. Mercersburg, Pa., 1844–63, and Union Theol. Sem., N. Y., from 1869; organizer and pres. Am. Bible Revision Committee. *Hist. Christian Ch.*, 7 vols., 1858–92; *Person of Christ*, 1865; *Creeds of Christendom*, 3 vols., 1877; *Theol. Propædentis*, 1893. He edited Lange's and other commentaries; *Christ in Song*, 1869; *A Religious Encyclopædia*, based on Herzog's, 3 vols., 1883–84, and the *Nicene and Post-Nicene Fathers*, begun 1886.

Schäffle, ALBERT EBERHARD FRIEDRICH, b. 1831. German economist, prof. Tübingen 1861 and Vienna 1868. *Nationalökonomie*, 1861; *Kapitalismus und Sozialismus*, 1870; *Essence of Socialism*, 1874, tr. 1889.

Schall, JOHANN ADAM VON, 1591–1669. German Jesuit, missionary in China from 1622. He wrote a Latin history of the mission there, 1655, and after a period of success and imperial favor was twice imprisoned.

Schamyl, 1797–1871. Prophet and hero of the Caucasians in their struggle with Russia, 1834–59. Various generals were sent in succession to the Caucasus, and new plans of attack tried, without lasting result, till he was made prisoner Sept. 6, 1859.

Schandorph, SOPHUS KRISTIAN FREDERIK, b. 1834. Danish realistic novelist. *Quiet Folk*, 1889.

Scharf, JOHN THOMAS, LL.D., b. 1843. Historian of Md., 1874–82, Baltimore, 1881, and Phila., 1884.

Scharnhorst, GERHARD JOHANN DAVID VON, 1756–1813. Prussian commander and military writer; chief of Blücher's staff at Eylau 1807; Lieut.-gen.; leader in the reconstruction of the Prussian army 1807; author of the short-service system.

Scharwenka, LOUIS PHILIPP, b. 1847. Head of a conservatory in Berlin. His compositions are largely orchestral and in the larger forms: symphonies, symphonic poems, overtures, etc.—His brother, FRANZ XAVIER, b. 1850, pianoforte virtuoso, and composer, came to New York 1891, founded a conservatory, and has since remained there. His opera *Mataswintha* was performed at Weimar 1896 and in New York 1897.

Schaufelin, HANS LEONHARD, ab.1487–1540. Historical painter of the German school. He was a pupil of Durer, whose manner he imitated so well that many of his pictures have been accredited to his master.

St. Elizabeth, by Schaufelin.

Schauffler, WILLIAM GOTTLIEB, D.D., LL.D., 1798–1883. German-American missionary at Constantinople 1831–74. He tr. the Bible into Osmanli-Turkish.

Schaumberg-Lippe. Principality of n.w. Germany. Area 131 sq. m.; pop., 1890, 39,183.

Schedone, BARTOLOMMEO, 1560–1615. Italian painter.

Scheele, KARL WILHELM, 1742–1786. Swedish chemist, pioneer in nearly every branch, especially the organic. *Air and Fire*, 1777, tr. 1780; *Memoires*, 1785–88.

Scheele, KNUT HENNING GAZELIUS VON, b. 1838. Prof. Upsala 1879; Bp. of Gothland 1885; theological writer.

Scheele's Green. $CuHAsO_3$. Cupric arsenite, made by adding an ammoniacal solution of arsenious acid to copper sulphate; poisonous.

Scheelite. $CaWO_4$. Natural calcium tungstate, characterized by a specific gravity of ab. 6. Its usual mode of occurrence is in the older crystalline rocks, associated with several other minerals, in which tungsten or fluorine is a component.

Scheffel, JOSEPH VIKTOR VON, 1826–1886. German poet. His most important works were his first, *Der Trompeter von Säkkingen*, 1854, an epic, and *Ekkehard*, 1857, tr. 1896, a novel of the Middle Ages, which had an immense circulation. Next in popularity were his humorous lyrics, *Gaudeamus*, 1867, tr. 1872.

Scheffer, ARY, 1797–1858. French painter, chiefly of religious subjects, whose reputation is possibly due, in part, to court influence. He was a devoted adherent of the Orleans.

Weeping (at the Luxembourg), by Ary Scheffer.

He was not in sympathy with any of the schools of painting, but formed a style of his own, more sentimental than vigorous. Examples in the Louvre are *St. Monica* and *Christ's Temptation*.

Scheffler, JOHANN ("ANGELUS SILESIUS"), 1624–1677. German hymnist, converted to R. C. Ch. 1653. His lyrics have much sweetness and beauty; his *Ecclesiologia*, 1677, is vehemently polemic.

Scheldt. River of Belgium, rising in n. France, flowing n.e. to Antwerp, and thence n.w. to the North Sea. Length 200 m.

Schelling, FRIEDRICH WILHELM JOSEPH VON, 1775–1854. Prof. of Philosophy at Jena 1798, Würzburg 1803–8, Erlangen 1820, Munich 1827, and Berlin from 1841. His views were pantheistic in type. *Natural Philosophy*, 1797; *World-soul*, 1799; *Transcendental Idealism*, 1800; *Philosophy and Religion*, 1804.

Schem, ALEXANDER JACOB, 1826–1881. German-American journalist and cyclopedist; ed. *Conversations-Lexicon*, 1869–74.

Schemnitz. Hungarian town 66 m. n. of Budapest, noted as being the oldest and most famous mining town of Hungary. It produces silver chiefly, but copper and lead are also found. The town has a noted school of mines.

Schenck, JAMES FINDLAY, U.S.N., 1807–1882. Commander 1855, Commodore 1863; prominent in the attacks on Fort Fisher, N. C.; Rear-admiral 1868.—His brother, ROBERT CUMMING, 1809–1890, was M.C. from Ohio 1843–51 and 1863–70, Minister to Brazil 1851–53, Brig.-gen. U.S. Vols. 1861, Major.-gen. 1862–63, and Minister to England 1870–76.

Schenectady. Capital of S. co., N. Y., on the Mohawk, 17 m. w. of Albany; founded 1661; burned by Indians 1690; chartered 1798; site of Union Univ., founded 1795. General Electric Co. have their works here. Pop., 1890, 19,902.

Schenk, AUGUST, 1815–1891. Prof. of Botany in Leipzig 1868. *Flora der Umgebung von Würzburg*, 1848; *Die Spermatozoiden im Pflanzenreich*, 1864; *Die fossile Flora der Grenzschichten des Keupers und Lias Frankens*, 1867; *Mittheilungen aus dem Gesammtgebiete der Botanik*, 1871.

Schenkel, DANIEL, D.D., 1813–1885. Prof. Heidelberg from 1851; leader of the Protestantenverein; ed. *Kirchliche Zeitschrift*, 1860–72, and *Bibel-Lexicon*, 5 vols., 1869–75. *Das Wesen des Protestantismus*, 3 vols., 1846–51; *Dogmatik*, 1858–59; *Character of Jesus*, 1864, tr. 1866. His later works are strongly humanitarian.

Schenkendorf, MAX VON, 1783–1841. German patriot, whose songs were called forth by the war of liberation, and pub. 1815.

Scherer, EDMOND HENRI ADOLPHE, 1815–1889. French critic; prof. Geneva 1845–50; Deputy 1871. *A. Vinet*, 1853; *Critique Religieuse*, 1860; *Litterature Contemporaine*, 9 vols.

Scherer, WILHELM, 1841–1886. Prof. Vienna 1868–72, Strassburg 1872–77, and Berlin from 1877; historian of the German language (1868) and literature (1883). *Goethe*, 1886.

Schereschewsky, SAMUEL ISAAC JOSEPH, b. 1831. P. E. bp. to China 1877–83; tr. O. T. into Mandarin Chinese.

Scherr, JOHANNES, 1817–1886. German novelist and critic, historian of English literature (1854), biographer of Schiller, 1859, and Blücher, 3 vols., 1862–63; prolific writer.

Scherzer, KARL VON, b. 1821. Austrian traveler; descriptive and scientific writer.

Scherzo. Generally, third movement in a musical composition of a cyclical kind, as a sonata or symphony; so called because of its playful or jocose character. It is the successor of the minuet, which, as a rule, it follows in form. It is commonly written in triple time, but nationalism and other influences have led to great freedom in this respect.

Scheuchzer, JOHANN, 1684–1738. Botanist at Zurich. *Agrostographia*, 1719.

Scheveningen. Summer resort of s. Holland, near The Hague. Off it Van Tromp was defeated and slain by the English 1653.

Schiaparelli, GIOVANNI VIRGINIO, b. 1835. Director of Milan Observatory 1862. *Shooting Stars*, 1867.

Schidone, B. See SCHEDONE.

Schiedam. Town of s. Holland, near Rotterdam; noted for its production of gin (schnapps). Pop., 1891, 25,260.

Schiele-curve Pivot. Form for the end of thrust-shafts (see PIVOT), named from the inventor of a method for easy drawing of the tractrix, or curve of equal tangents. Let a T-square be laid upon a drawing-board, upon whose blade fits a sliding block: let a ruler bear at one end a tracing point and a sufficient weight to press it down, and let its other end fit upon a pin on the sliding block. If this ruler be adjusted to be at right angles with the blade of the T-square, and the slider be then moved along the blade, the tracing-point will then describe a tractrix. It has the property of having the tangents equal at every point, and therefore the thrust along the axis at each section varies as the area of the ring of contact at that point, and the bearing wears equally all over.

Schiff, MORITZ, b. 1823. Prof. Berne 1852, Florence 1862, and Geneva 1876; writer on physiology.

Schiller, HERMAN, b. 1839. Prof. Giessen 1876; writer on education and Roman history.

Schiller, JOHANN CHRISTOPH FRIEDRICH, 1759–1805. Greatest of German poets after Goethe, with whom he was associated at Weimar from 1800. His dramatic works are *The Robbers*, 1781; *Fiesco*, and *Intrigue and Love*, 1783; *Don Carlos*, 1787; the great trilogy of *Wallenstein*, 1799; *Mary Stuart*, 1800; *The Maid of Orleans*, 1801; *The Bride of Messina*, 1803; and *William*

Johann Schiller.

Tell, 1804. His minor poems include *The Song of the Bell* and some noble ballads. His chief prose work is a *History of the Thirty Years' War*, 1793. Through illness and poverty he was faithful to lofty standards; his character was worthy of his genius. His works filled 17 vols. in the edition of 1868–76. Most of his writings exist in English versions.

Schilling. Small base silver coin of Hamburg and some other German cities and states, value 2 cts.

Schilling, JOHANNES, b. 1828. German sculptor, prof. Dresden 1868. *Luther*, Worms; *Schiller*, Vienna.

Schimmelin, OEXMELIN, or ESQUEMELIN, ab.1645–1707. Flemish historian of the buccaneers. His book appeared in French 1684, and in Dutch 1700.

Schimmelpenninck, MARY ANN (GALTON), 1788–1856. English author.

Schimmelpfennig, ALEXANDER, 1824–1865. Brig.-gen. U. S. Vols. 1862–65.

Schimper, WILHELM PHILIPP, 1808–1880. Prof. at Strassburg. *Recherches anatomiques et morphologiques sur les mousses*, 1850; *Bryologia Europæa*, 1836–55; *Synopsis muscorum Europæorum*, 1860; *Le terrain de transition des Vosges*, 1862; *Paléontologie végétale*, 1869.

Schinkel, KARL FRIEDRICH, 1781–1841. German architect; prof. Berlin Academy 1820.

Schipperke. Breed of dogs found in Belgium, belonging to the same group as the Pomeranian and Eskimo dogs.

Schism. Division in or separation from a Church; frequent from ab.250. The Great Schism is (1) that between East and West, beginning ab.880; (2) that of 1378–1429, when there were at once two claimants of the popedom, one in Avignon and one in Rome, and sometimes more. It was virtually ended by Council of Constance 1417.

Schist. Foliated rock; one with a tendency to split readily in one direction, due to a parallelism of arrangement of cleavable mineral components, such as mica, talc, or chlorite.

Schistose. Breaking into slabs like flagging stone, usually confined to crystalline rocks.

Schizæaceæ. Family of ferns, mainly of tropical distribution, including various climbing species, as the Hartford Ferns. *Schizæa pusilla*, a minute fern with filiform leaves, occurring on the Atlantic seaboard of N. America, and known locally as Curley-grass, is one of the most interesting of the order.

Schizocarp. Dry fruits in which the carpels are indehiscent but split apart at maturity.

Schizocœl. Body-cavity formed by primary splitting of a mass of mesoderm cells into two layers, as in Rotifers and Nematodes. In Chætopods it is a secondary form of an ENTEROCŒL (q.v.).

Schizocœla. 1. Animals possessing a schizocœl. 2. Subgroup of *Vermes*, including the CHÆTOPODA (q.v.).

Schizogenesis. Reproduction by fission.

Schizogenic. Method of formation of intercellular spaces in vegetable tissue, which develops them coincidently with the tissue.

Schizognathous. Skulls of birds, in which the maxillopalatine processes are separated by a cleft in the roof of the mouth. The vomer is long, pointed in front, and narrow behind. Examples are Plovers, Gulls, Penguins, Cranes, Fowls, Pigeons, Grouse. These have been included in a group called *Schizognathæ* or *Schizorhina*. Of the natatorial birds included there are two sections, *Brevipennati* and *Longipennati*.

Schizomycetes. Class of *Protophyta*, including those microscopic organisms in which chorophyll is wanting, and propagation effected by cell-division or splitting; known as Bacteria and Microbes.

Schizonemertea. Group of nemertean worms, characterized by the presence of deep longitudinal ciliated fissures on the sides of the head; the mouth is behind the brain, and the proboscis is unarmed.

Schizopelmous (MONOPELMOUS). Common arrangement of the flexor tendons of the feet of birds, in which the first digit has its own tendon, the other toes a common tendon.

Schizophyceæ. Division of *Protophyta*, including only those which contain chlorophyll.

Schizopoda. 1. See TRAGULINA. 2. Small *Thoracostraca* with a large, soft, cephalothoracic shield, and eight pairs of biramous, thoracic feet, the anterior of which are not modified as maxillipeds, but, in many forms, bear gills. The abdomen ends in a strong telson, and bears appendages that are delicate in the female, but strong in the male. In *Mysis* the last appendages have auditory organs (otoliths) developed in the endopodite.

Schizotrocha. Order of Rotifers, including forms having an anus, and with the trochal disk notched or lobed.

Schkuhr, CHRISTIAN, 1741–1811. German botanist. *Botanisches Handbuch der mehrsten theils in Deutschland*, 1808; *Enchiridion botanicum*, 1805; *Beschreibung und Abbildung der theils bekannten*, 1801; *Deutschlands kryptogamische Gewächse*, 1810–47.

Schlagintweit, HERMANN VON, 1826–1882. Explorer of the Alps and Himalayas, and writer on their physical geography. *India and High Asia*, 1860–66. Associated in these tasks were his brothers ADOLF, 1829–1857, and ROBERT, 1833–1885. Robert became prof. at Giessen 1863, visited the U.S. 1869 and 1880, and pub. books on California, the Pacific R.R., and the Mormons. Their brother, EDUARD, 1831–1866, wrote on the Spanish war with Morocco, 1863, and the youngest, EMIL, b. 1835, on Thibet, 1860–66.

Schlatter, MICHAEL, 1716–1790. Organizer of the German Reformed Ch. in America 1747.

Schlechtendal, DIEDRICH FRANZ LEONHARD VON, 1794–1866. Prof. of Botany in Halle 1833. *Animadversiones botanicæ in Ranunculeas*, 1819–20; *Flora Berolinensis*, 1823–24.

Schlegel, AUGUST WILHELM VON, 1767–1845. German critic of high rank and great influence, translator of Shakespeare, Dante, and Camoens; prof. Bonn from 1818. *Dramatic Art and Literature*, 1808, tr. 1815. *Works*, 12 vols., 1846–47.—His brother, FRIEDRICH, 1772–1829, as gifted but more erratic, led the Romantic School and became a reactionist. He was one of the founders of comparative philology: his *Sprache und Weisheit der Indier*, 1808, was important for the study of Sanskrit. *Hist. Literature*, 1814, tr. 1859; *Philosophy of History*, 1827, tr. 1835. *Works*, 15 vols., 1846. His poetry, like his brother's, is unimportant.

Schlegel, ELIAS, 1718–1749. German dramatist.

Schleicher, AUGUST, 1821–1868. Prof. Prague 1850, Jena 1857. He wrote on the Latin, German, and Slavonic tongues, developed Indo-Germanic philology, and considered the study of language a natural science.

Schleiden, MATTHIAS JAKOB, 1804–1881. German botanist. *Grundzüge der wissenschaftlichen Botanik*, 1842–43; *Zeitschrift für wissenschaftliche Botanik*, with Karl Naegeli, 1844–46; *Grundriss der Botanik*, 1846; *Die Pflanze und ihr Leben*, 1847, tr. 1848; *Handbuch der medizinisch pharmaceutischen Botanik*, 1852–57.

Schleiermacher, FRIEDRICH ERNST DANIEL, 1768–1834. Prof. Halle 1804–6, and Berlin from 1810; foremost of German theologians. He sought to unite the Lutheran and Reformed Churches, aimed to reconcile the philosophic with the religious spirit, developed a system wherein the feelings have as large place as the intellect, and exerted a deep and wide influence, especially by his *Christian Faith*, 1821–22. *Monologues*, 1800;

tr. Plato, 1801–10; *Systems of Ethics*, 1803. His works, collected 1836–65, include 10 vols. of sermons, 11 on theology, and 9 on philosophy, besides letters, partly tr. 1860.

Schleswig-Holstein. Province of Prussia; held by Denmark till 1864; previously two duchies, at times united, oftener separate. Pop., 1890, 1,219,523.

Schliemann, HEINRICH, D.C.L., 1822–1890. German-Russian merchant, naturalized in Cal. 1850; enthusiast for the Trojan legend; excavator at Hissarlik 1870–82, and elsewhere. Most important were his discoveries at Mycenæ 1876–88. *Mykenæ*, tr. 1877; *Ilios*, 1880; *Orchomenos*, 1881; *Troja*, 1883; *Tiryns*, 1886.

Schlippe's Salt. Na_3SbS_4. Sodium sulphantimonate; made by dissolving antimony pentasulphide in sodium sulphide.

Schlosser, FRIEDRICH CHRISTOPH, 1776–1861. Prof. Heidelberg 1819. *Weltgeschichte*, 9 vols., 1817–24; do., 18 vols., 1844–56; *Hist. 19th Century*, 1823, tr. 1843–52; *Der alten Welt*, 1826–34; *Dante*, 1855. His works are highly moral and have been very popular.

Schlotheim, ERNST FRIEDRICH VON, 1764–1832. Chief-justice in Gotha. *Flora der Vorwelt*, 1804; *Die Petrefactenkunde*, 1820; *Nachträge zur Petrefactenkunde*, 1822.

Schlözer, AUGUST LUDWIG VON, 1735–1809. Prof. Göttingen 1764. *Allgemeine Nordische Geschichte*, 1772.

Schlüter, ANDREAS, ab.1662–1714. German architect and sculptor, whose works are among the noblest art productions

Dying Warriors, by Schluter, in the Berlin Arsenal.

of the epoch. His principal works are *The Great Elector* and the *Dying Warriors*, both in Berlin.

Schlyter, KARL JOHAN, 1795–1888. Compiler of old Swedish laws, pub. in 12 vols. 1827–77.

Schmalkald, ARTICLES OF. One of the Symbolical Books of the Lutheran Ch.; prepared by Luther at Wittenberg 1536; accepted by the League 1537.

Schmalkald, LEAGUE OF. Organized 1531 for defense of German Protestantism by nine princes and eleven imperial cities; soon joined by others; led by Elector of Saxony and Landgrave of Hesse; defeated at Mühlberg, April 24, 1547, by Charles V., and dissolved; revived 1552 by Maurice of Saxony.

Schmauk, THEODORE EMANUEL, b.1860. American Lutheran editor and author. Editor of *The Lutheran* since 1889. *Negative Criticism*, 1894.

Schmid, CHRISTIAN FRIEDRICH, 1794–1852. Prof. Tübingen 1821. *Biblical Theology of N. T.*, tr. 1870.

Schmid, HEINRICH, 1811–1885. Prof. Erlangen from 1848. *Dogmatik*, 1843, tr. 1875; *Dogmengeschichte*, 1860.

Schmid, LEOPOLD, 1808–1869. Prof. Giessen from 1839; opponent of ultramontanism. *Geist des Katholicismus*, 1848–50.

Schmidel, ULRICH, ab.1511–ab.1570. Bavarian soldier, in S. America ab.1535–52. His diary, pub. 1557, appeared in Latin 1599. It deals largely with Argentina.

Schmidt, CHARLES GUILLAUME ADOLPHE, D.D., b. 1812. Prof. Strassburg 1843–77. *Hist. des Cathares*, 1849; *Early Christianity*, 1853, tr. 1885.

Schmidt, HEINRICH JULIAN, 1818–1886. Prussian journalist and critic; historian of German literature, 1850–86.

Schmidt, HENRY IMMANUEL, D.D., 1806–1889. Prof. Columbia Coll. 1848–80. *Hist. Education*, 1842.

Schmidt, JOHANNES, b. 1843. Prof. Comparative Philology at Berlin 1876; writer on Indo-Germanic languages.

Schmidt-Rimpler, HERMANN, b. 1838. Prof. of Ophthalmology at Marburg 1873, and Göttingen 1891. *Augenheilkunde und Ophthalmoskopie*, 1885.

Schmitz, LEONHARD, 1807–1890. German-English teacher; editor or author of many school-books; tr. Niebuhr, and Zumpt's Latin Grammar.

Schmolck, BENJAMIN, 1672–1737. German hymnist. His lyrics are highly popular at home, and several are familiar in English versions.

Schmoller, GUSTAV, b. 1838. Prof. Halle 1864, Strassburg 1872, and Berlin 1882; writer on political economy. *Zur Geschichte der deutschen Kleingewerbe im 19 Jahrhundert*, 1870; *Ueberdie Resultate der Bevölkerungs und Moralstatistik*, 1871; *Strassburgs Blüthe und die Volkswirthschaftliche Revolution im 13 Jahrhundert*, 1875; *Strassburg zur Zeit der Zunftkämpfe*, 1875; *Die Strassburger Tücher und Weberzunft*, 1878; *Zur Sozial und Gewerbepolitik der Gegenwart*, 1890.

Schmucker, SAMUEL SIMON, D.D., 1799–1873. Prof. Gettysburg Theol. Sem., Pa., 1826–64; leader in the General Synod, and author of its formula of discipline, 1827, and of sundry doctrinal works. *American Lutheranism Vindicated*, 1856.—Of his sons, SAMUEL MOSHEIM, 1823–1863, was an industrious book-maker; BEALE MELANCTHON, D.D., 1827–1888, was eminent in liturgics, and a leader in the Pa. Synod and the General Council.

Schnabziger Cheese. Green cheese from the canton of Glaris, Switzerland. The milk is coagulated with vinegar instead of rennet, and treated with zigerlec, a plant. In the U. S. it is called Sago and Sap Sago cheese.

Schneeberg. Mining town of Saxony, 20 m. s.w. of Chemnitz, producing tin, cobalt and silver. It manufactures chemicals and laces. Pop. 8,200.

Schneekoppe. Highest point of the Riesengebirge, between Bohemia and Prussian Silesia. Altitude 5,260 ft.

Schneider, JOHANN GOTTLOB, 1750–1822. Prof. Frankfort 1776; editor of Theophrastus and other classics, and of a Greek lexicon, 1797–1821. *Scriptores Rei Rusticæ*, 4 vols., 1794–95.

Schneider, KARL ERNST CHRISTOPH, 1786–1856. Prof. Breslau from 1816; editor of Plato, Proclus, and Cæsar.

Schneidewin, FRIEDRICH WILHELM, 1810–1856. Prof. Göttingen from 1837; editor of Sophocles, Pindar, and other classics.

Schnetz, JEAN VICTOR, 1787–1870. French painter.

Schnitzer, EDUARD. See EMIN PASHA.

Schnizlein, ADELBERT, d. 1868. Prof. of Botany in Erlangen. *Die Flora von Bayern*, 1847; *Die Vegetationeverhältnisse der Jura-und Keuperformation*, 1848.

Schnorr von Karolsfeld, JULIUS, 1794–1872. Painter and illustrator; prof. Munich 1827, where he produced the

Cain slaying Abel, by Schnorr von Karolsfeld.

Nibelungen frescoes in the palace; prof. Dresden 1846. His *Luther at Worms* is familiar through engravings. *Bible Pictures*, 1860.

Schœlcher, VICTOR, 1804–1893. French author; Deputy 1848–51; in England 1851–70; life-senator 1875; biographer of Handel and of Toussaint l'Ouverture. His works are largely against slavery.

Schofield, JOHN MCALLISTER, U.S.A., b. 1831. Prof. West Point 1855–60; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; commanding in Mo. 1862–63; engaged under Sherman and Thomas 1864–65; Brig.-gen. U.S.A. 1864; Sec. of War 1868–69; Major-gen. 1869; Supt. at West Point 1876–81; Lieut.-gen. 1895.

Schoharie. Local bed of sandstone in e. N. Y. See DEVONIAN.

Scholarship. Proceeds of an investment paid to a student for his maintenance at a school or college.

Scholasticism. Philosophic doctrine and method of the Middle Ages. As a method it was deductive logic, or the attempt to deduce all truth independently of experience; as a doctrine it was a combination of theology and Aristotelian philosophy. Its great exemplar is Aquinas.

Scholiasts. Writers of notes or glosses on the margins of ancient MSS. They flourished especially at Alexandria, and were more concerned often with the text itself than with the ideas it conveyed.

Scholium. Statement following a demonstration to apply, restrict, generalize, or illustrate the truth established.

Schöll, MAXIMILIAN SAMSON FRIEDRICH, 1766–1833. German-French historian of Latin and Greek literature, 12 vols., 1815–25; compiler of *Cours d'histoire*, 46 vols., 1830–36, and sundry political documents.

Scholten, JAN HENDRIK, 1811–1885. Dutch rationalist, prof. Leyden 1843–81. *Theology of Reformed Ch.*, 1848–50; *Introduction to N. T.*, 1853; *Gospel of John*, 1864; *Pauline Gospel*, 1870. His books were widely read in Germany and France.

Schömann, GEORG FRIEDRICH, 1793–1879. Prof. Greifswald from 1823. *Greek Antiquity*, tr. 1880.

Schomberg, FREDERICH HERMANN, DUKE OF, 1616–1690. German officer, in the French service 1650–85; distinguished as a tactician. He secured the recognition of Portugal's independence 1668, became Marshal 1675, was next in command to William of Orange 1688, was made Duke 1689, and fell in the battle of the Boyne.

Schomburgk, SIR ROBERT HERMANN, Ph.D., 1804–1865. German-English traveler; explorer of Guiana; discoverer of the *Victoria regia*, 1837; knighted 1844; British representative in Siam 1857–64; author of a *History of Barbadoes*, 1847, and several books on Guiana.

Schönbein, CHRISTIAN FRIEDRICH, 1799–1868. Prof. Basel 1828; writer on chemistry; discoverer of ozone 1839; inventor of gun-cotton 1845.

Schönbein's Test. Paper prepared with starch and potassium iodide, sensitive to the presence of ozone, which sets free the iodine, turning the starch blue.

Schönberg, GUSTAV, b. 1839. Prof. Bonn 1868, Freiburg 1871, and Tübingen 1873; economist. *Arbeitsämter*, 1871; *Finanzverhältnisse der Stadt Basel im 14 und 15 Jahrhundert*, 1879. He was joint-compiler of *Handbuch der Politischen Oekonomie*, 1882.

Schönbrunn. Immense palace near Vienna, erected for Maria Theresa 1744. Here the treaty of Vienna was signed 1809 between Napoleon and Francis I. Cessions of territory were made by Austria to the Rhenish Confederation, to Napoleon, the King of Saxony, the Duke of Warsaw, and the Czar.

Schönfeld, EDUARD, 1828–1891. Assistant to Argelander in his great survey of the northern heavens: director of the observatory at Mannheim 1859–75, and at Bonn 1875; best known for his work in stellar astronomy, particularly variable stars.

Schongauer, MARTIN, 1446–1488. German painter, of Colmar in Alsace.

Schönlein, JOHANN LUCAS, 1793–1864. Prof. Würzburg 1820, Zurich 1833, and Berlin 1839–59; introducer of improved methods of medical study.

School, PUBLIC. First in America was established in Boston 1635. National Schools were instituted in England 1811, in Ireland 1831.

Schoolcraft, HENRY ROWE, LL.D., 1793–1864. Geologist with Gen. Cass to the Mississippi 1820; explorer of the Sources of the Mississippi 1832; in the U. S. service nearly 50 years; chiefly eminent as an ethnologist. His most important writings are on the history and customs of the aborigines. *Algic Researches*, 1839; *Indian Tribes*, 6 vols., pub. by Congress 1851–57.

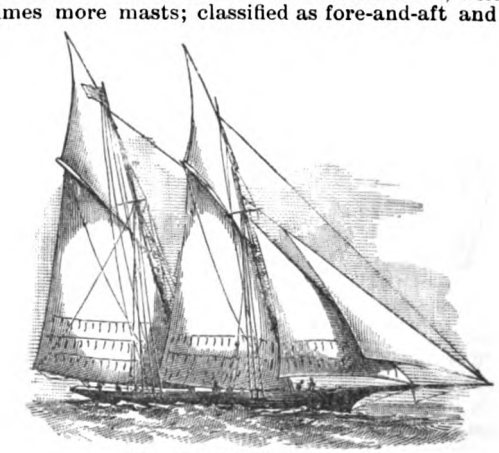
Schoolmen. Leaders of thought in the Middle Ages, occupied almost wholly with theology and philosophy. They monopolized the limited learning of their times, and were pioneers in a manner; but their work was useful mainly for the avoidance of a mental vacuum. See SCHOLASTICISM.

School of Naples. See NATURALISTS.

Schools, BROTHERS OF CHRISTIAN. R. C. order founded at Rheims 1684 by De la Salle; confirmed by the pope 1725; now widely extended. A similar society was formed in Ireland 1802.

Schools of Painting. These include the painters of a country, province or city, or a group of painters under the influence of one man. In Italy, the Byzantine school was paramount in the 12th and early 13th centuries, with Giotto and Cimabue as the leading artists, and Pisa and Lucca the chief seats of this rude painting. In the 13th and 14th centuries, Siena, with Martino and Lorenzetti, was more productive in development of the art, inaugurated by Giotto at Florence. The Florence school was the most important in Italy, and in the 15th century reached its climax, with Leonardo da Vinci, Michelangelo and Andrea del Sarto as its great lights. In the 15th and 16th centuries the Umbrian school produced many painters of importance, with Piero della Francesco as its best example. In Padua was Andrea Mantegna, and at Arezzo, Spinello di Luca and Lorenzo di Bicci. The Venetian school was prominent in the 15th and 16th centuries, with Giorgione, Titian, Tintoretto and Paul Veronese. The Brescian school had Moretto in the 16th century, and Verona from the 13th to the 17th century had Pisanello, Domenico and Carazola. Bologna from the 14th to the 17th century produced the Caracci, Guido and Domenichino. Modena and Parma had many painters from the 14th to the 16th centuries, Correggio being the most prominent. Milan in the 15th and 16th centuries was an important school, created by Leonardo da Vinci. The Roman school consisted of the pupils of Raphael. The German school originated at Cologne in the 14th century; the leading artists here were Albert Durer, Hans Holbein and Overbeck. In the Flemish school, beginning with the 15th century, are the Van Eycks and the Van der Weydens, and later Rubens and Van Dyck. The Dutch school includes Rembrandt, its greatest painter, the Teniers and Wouverman in genre subjects; Ruysdael and Hobbema in landscape; Vandevelde in sea views, and Paul Potter in animal pictures. Spain produced Velasquez, Murillo and Fortuny. In France were Poussin, Lorrain, Vernet, Rousseau and Millet. England gave Lely, Hogarth, Reynolds, Gainsborough, Blake, Turner and Landseer.

Schooner. Vessel of small or moderate size, with two or sometimes more masts; classified as fore-and-aft and topsail;



Fore-and-aft Rigged Schooner.

the latter having on the foremast square topsail and topgallantsail, which gives it the advantage before the wind; on the wind the former can sail closer to the wind.

Schoonmaker, AUGUSTUS, 1828–1894. Atty.-gen. of N. Y. 1878–79; active for reform and education.

Schopenhauer, ARTHUR, 1788–1860. German thinker and author, founder of philosophic pessimism. He asserted, in opposition to Hegelianism, that will rather than intellect was the primary principle in nature. *Die Welt als Wille und Vorstellung*, 1819.

Schoppe, KASPAR. See SCIOPPIUS.

Schorl. Class of hard, dark-colored minerals; term now practically obsolete, except as indicating black tourmaline.

Schott, CHARLES ANTHONY, b. 1826 in Germany. Officer of U. S. Coast Survey from 1848; writer on meteorology.

Schott, HEINRICH WILHELM, 1794–1865. Director of Royal Garden in Schönbrunn. *Synopsis Aroidearum*, 1856; *Prodromus Systematis Aroidearum*, 1860.

Schottische. Dance introduced in England 1848, when it was also known as the German Polka. The music is almost the same as that of the polka, but should be played slowly.

Schouler, JAMES, LL.D., b. 1839. American writer on law. *Bailments*, 1880; *Wills*, 1887. His *Hist. U. S. under the Constitution*, 5 vols., 1880–91, is an important work.—His father,

WILLIAM, 1814–1872, journalist in Mass. and Ohio, pub. *Hist. Mass. in the Civil War*, 1868–71.

Schouten, WILLEM CORNELIS, 1567–1625. Dutch seaman, first to round Cape Horn 1615.

Schouvaloff, PETER, COUNT, 1827–1889. Russian Minister to England 1873 and 1878.—His brother PAUL, b. 1830, has been prominent as a general and diplomatist.

Schrader, EBERHARD, D.D., b. 1836. Prof. Zurich 1863, Giessen 1870, Jena 1873, and Berlin 1875; O. T. critic and Assyriologist. *Cuneiform Inscriptions and O. T.*, 1872, tr. 1885–86; *Antiquities of the Aryan Peoples*, tr. 1890.

Schrader, HEINRICH ADOLPH, 1767–1836. Prof. of Botany at Göttingen. *Journal für die Botanik*, 1799–1803 and 1806–10; *Flora Germanica*, 1806.

Schrader, JULIUS FRIEDRICH, b. 1815. Historical and portrait painter, prof. Berlin Academy 1851.

Schrader, OTTO, b. 1855. Prof. Jena; antiquarian and philologist. *Prehistoric Antiquities of the Aryan Peoples*, tr. 1890.

Schrank, FRANZ VON PAULA, 1747–1835. Prof. of Botany at Munich. *Naturhistorische Briefe über Oestrich*, 1785; *Anfangsgründe der Botanik*, 1785; *Baiersche Flora*, 1789; *Sammlung naturhistorischer und physikalischer Aufsätze*, 1796; *Grundriss einer Naturgeschichte der Pflanzen*, 1803; *Flora Monacensis*, 1811–18.

Schreber, JOHANN CHRISTIAN DANIEL VON, 1739–1810. Prof. at Erlangen. *Beschreibung der Gräser nebst ihren Abbildungen nach der Natur*, 1769–1810; *De Persea Ægyptiorum commentationes*, 1790–92.

Schreiner, OLIVE (now MRS. CRINWRIGHT), b. ab. 1863. Anglo-African novelist. *Story of an African Farm*, 1883; *Dreams*, 1890; *Trooper Peter Halket*, 1897.

Schrevelius, CORNELIS, 1615–1664. Prof. Leyden 1642; ed. sundry classics. His Greek-Latin lexicon, 1654, was long and widely used.

Schreyer, ADOLF, 1828–1895. German animal painter, especially of sheep.

Schröckh, JOHANN MATTHIAS, 1733–1808. Prof. Wittenberg 1761. *Ch. History*, 45 vols., 1768–1812.

Schröder, FRIEDRICH LUDWIG, 1744–1816. German actor, eminent in Lear and other Shakespearean parts; manager at Hamburg 1771.

Schröder, SOPHIE (BÜRGER), 1781–1868. German actress, noted till 1840 in tragic parts.—Her daughter, WILHELMINE (MME. DEVRIENT), 1804–1860, was a famous singer.

Schröter, JOHANN HIERONYMUS, 1745–1816. Oberamtmann at Lilienthal near Bremen: there he built a small observatory, and for 34 years pursued the study of the heavens, particularly the planets.

Schubart, CHRISTIAN DANIEL, 1739–1791. German poet and satirist, imprisoned 1777–87.

Schubert, FRANZ PETER, 1797–1828. Most fecund melodist of all times, pioneer in modern harmonization, and creator of

Franz Peter Schubert.

the modern German artistic song (*Lied*). He studied with Salieri, and till his death taught music and poured out a flood of compositions, but was very poor. He wrote much, but not successfully, for the stage; none of his operas are in the current lists of to-day. Of his orchestral compositions two symphonies, one in C (his last, No. 9) and an unfinished one in B minor, are in the repertoires of practically all concert institutions. Of his chamber music the best known pieces are 9 string quartets in A minor and D minor and a quintet in C (Op. 163). His pianoforte and church compositions are very numerous, but all this mass of music is left in the shade by his songs with pianoforte accompaniment, which number ab. 800.

Schuchardt, HUGO, b. 1842. Prof. Halle 1873, and Gratz 1876; writer on philology.

Schueller, GUSTAV, 1787–1834. Prof. Tübingen. *Grundsätze der Agriculturchemie*, 1831; *Flora von Würtemberg*, with George von Martius, 1834; and many dissertations.

Schuerer, EMIL, Ph.D., b. 1844. Prof. Giessen 1878, Kiel 1890. *Hist. Jewish People*, 1874, tr. 1886–90.

Schulte, JOHANN FRIEDRICH, b. 1827. Prof. Prague 1855, Bonn 1871; Old Catholic leader; prolific writer on Ch. history and law.

Schultens, ALBERT, 1686–1750. Prof. Franecker 1711, Leyden 1729. His *Origines Hebræa*, 1724–38, is of historical importance.

Schultes, JOSEPH AUGUST, 1773–1831. Prof. Landeshut. *Oestreichs Flora*, 1794; *Flora Austriaca*, 1800; *Geschichte und Literatur der Botanik*, 1817.

Schultz, HERMANN, b. 1836. Prof. Göttingen 1876; follower of Ritschl. *O. T. Theology*, 1869, tr. 1892.

Schultz, KARL HEINRICH, 1798–1871. Prof. Berlin. *Die Natur der lebendigen Pflanze*, 1823–28; *Natürliches System des Pflanzenreichs*, 1832; *Sur la circulation et sur les vaisseaux lactifères dans les plantes*, 1839; *Die Anaphytose oder Verjüngen der Pflanzen*, 1843; *Neues System der Morphologie der Pflanzen*, 1847.

Schultze, KARL AUGUST JULIUS FRITZ, b. 1846. Prof. Jena and Dresden; writer on philosophy and education.

Schultze-Delitzsch, HERMANN, 1808–1883. Founder of the German co-operative movement; prominent in the Parliament of 1848. He founded the first co-operative loan society 1850, on English models. He devoted his life to the advancement of this movement, acting as counsel for the united societies for many years, and editing a periodical in their interests. *Association*, 1862; *Vorschuss und Kreditvereine*, 1863; *Die Genossenschaften in den eingelnen Geuerbzweigen.*

Schultze's Powder. Explosive containing nitrolignin as its main ingredient, introduced in Germany by E. Shultze soon after gun-cotton was invented. It is used mainly as a sporting powder. Nitrolignin is made by nitrating wood, from which all resinous matter has been removed, and then granulating it by grinding. See GUN COTTON and NITROCELLULOSE.

Schumacher, HEINRICH CHRISTIAN, 1780–1850. Prof. Copenhagen 1810–21; he founded *Astronomische Nachrichten*, 1821, best known of astronomical journals.

Schumann, ROBERT, 1810–1856. German composer, leading spirit in the Romantic movement in music; profoundly poetical and original artist, keen and kindly critic. He founded a journal 1834 in which to champion musical progress, soon became a power, and was insane from 1854. Among his compositions are four symphonies, an opera, *Genoveva*, several concert overtures, one of the loveliest of pianoforte concertos, many small pieces for the pianoforte with poetical titles and contents, two cantatas, *Paradise and the Peri*, and *The Pilgrimage of the Rose*, music to part of Goethe's *Faust*, and to Byron's *Manfred*, three string quartets, other chamber pieces and many songs.—His wife, CLARA JOSEPHINE (WIECK), 1819–1896, m. 1840, was a pianoforte virtuoso. She played in public at 10, began her artistic travels at 13, and taught 1878–92 at a conservatory in Frankfort-on-the-Main.

Schürer, EMIL, b. 1844. Prof. Giessen 1878. *Hist. Jews*, tr. 5 vols. 1886–90.

Schurman, JACOB GOULD, LL.D., b. 1854 in Prince Edward Island. Prof. Cornell Univ. 1886, pres. 1892. *Kantian Ethics*, 1881; *Darwinism*, 1888.

Schurz, CARL, LL.D., b. 1829 in Germany. U. S. Minister to Spain 1861; Brig.-gen. U. S. Vols. 1862, Major-gen. 1863–65, serving in Va. and at Gettysburg and Chattanooga; U. S. Senator from Mo. 1869–75; Sec. Interior 1877–81; ed. N. Y. *Evening Post* 1881–84; active in all political reforms. *Life of Clay*, 1887.

Schussele, CHRISTIAN, 1824–1879. French-American historical painter, prof. Phila. Academy from 1868. Some of his works are well-known through engravings.

Schut, CORNELIS, 1597–1655. Historical painter of the Flemish school. Among his most famous paintings are *Hero*

Hero and Leander, by Cornelis Schut.

and Leander and *Tribute to Cæsar*. He was a student of Rubens, whose style he closely imitated.

Schütz, HEINRICH (SAGITTARIUS), 1585–1672. German composer, who introduced opera into Germany (*Dafne*, performed 1627), and in church music was a worthy predecessor of Bach.

Schuvalov. See SCHOUVALOFF.

Schuyler, EUGENE, LL.D., 1840–1890. U. S. Minister to Greece 1882–84; author of *Turkestan*, 1876; *Peter the Great*, 1884; *American Diplomacy*, 1886.—His father, GEORGE WASHINGTON, 1810–1888, pub. *Colonial New York*, 1885.

Schuyler, MONTGOMERY, b.1843. American journalist. *Studies in American Architecture*, 1892.

Schuyler, PETER, 1657–1724. First Mayor of Albany, N.Y., 1688; active in colonial affairs and in French and Indian wars, as was his nephew, PETER, 1710–1762.

Schuyler, PHILIP JOHN, 1733–1804. Major-gen. 1775–79; commanding on the N. Y. frontier; sacrificed to intrigues and misrepresentations, and superseded by Gates on the eve of Burgoyne's surrender; delegate to Congress 1777–81; U.S. Senator 1789–91 and 1797–98.

Schuylkill. River rising near Pottsville, Pa., and flowing s.e. past Reading and through Phila. to the Delaware. Length 130 m.

Schwab, GUSTAV, 1792–1850. Teacher and pastor at Stuttgart; lyric poet; biographer of Schiller, 1840.

Schwalbe, GUSTAV ALBERT, b. 1844. Prof. Jena 1873, Königsberg 1881, and Strassburg 1883. *Neurologie*, 1881; *Anatomie der Sinnesorgane*, 1887.

Schwalber, or CHELIDONIUS, d. 1521. German monk and Latin versifier.

Schwann, THEODOR, 1810–1882. Prof. of Anatomy at Louvain 1838 and Liège 1848; discoverer of pepsin; author of the cell-theory. *Structure of Plants and Animals*, 1839, tr. 1847.

Schwanthaler, LUDWIG MICHAEL, 1802–1848. Prolific Bavarian sculptor, prof. Munich Academy 1835.

Schwartz, CHRISTIAN FRIEDRICH, 1726–1798. German missionary in India from 1750.

Schwarz, BERTHOLD. German Franciscan monk, b. in Freiburg, Baden, in the 14th century, reputed inventor of gunpowder ab.1330; a monument was raised to his honor there 1853.

Schwarz, MARIE SOPHIE (BIRATH), 1819–1894. Swedish novelist. *Man of Birth*, 1858; *A Child of the Time*, 1873.

Schwarzburg-Rodolstadt AND **-Sondershausen.** German principalities, in the Saxon region. Areas, 363 and 333 sq. m.; pop., 85,863 and 75,510.

Schwarzenberg. German house, ennobled 1417.—ADAM, GRAF VON, 1584–1641, Premier of Brandenburg, attempted to keep his country neutral during the 30 Years' War.—KARL PHILIPP, PRINCE, 1771–1820, was Austrian Field-marshal 1800, Envoy to Russia and France 1808–9, and victor at Dresden and Leipzig 1813.—His nephew, FELIX LUDWIG JOHANN FRIEDRICH,

Felix Schwarzenberg.

1800–1852, was Austrian Chancellor from 1848.—His brother, FRIEDRICH JOHANN, 1809–1885, became Abp. of Salzburg 1836, of Prague 1849, and Cardinal 1842.

Schwatka, FREDERICK, U.S.A., 1849–1892. Arctic explorer. He found the remains of Sir John Franklin's party 1878–80, traced the course of the Yukon River 1883, and led other expeditions in Alaska 1886 and 1891, and one in n. Mexico 1889.

Schwegler, ALBERT, 1819–1857. Prof. Tübingen 1847. *Hist. Philosophy*, 1848, tr. 1856.

Schweigger, KARL ERNST THEODOR, b. 1830. Prof. Berlin 1873; writer on the eye.

Schweighauser, JOHANN, 1742–1830. Prof. Strassburg 1770; ed. Polybius, Epictetus, Athenæus, Herodotus, and other classics.

Schweinfurth, GEORG AUGUST, b. 1836. German traveler in the Nile region 1864, and in the Soudan 1869–71; director Cairo Museum 1880–88. *Plantæ Nilaticæ*, 1863; *Flora Æthiopicus*, 1867; *Heart of Africa*, tr. 1874; *Artes Africanæ*, 1875.

Schweinfurth Green, or PARIS GREEN. Aceto-arsenite of copper. Used on wall-papers, as a dye and to kill vermin. Made by treating a basic acetate of copper with arsenious acid; poisonous. It was first made at Schweinfurth 1811.

Schweinitz, LEWIS DAVID DE, 1780–1834. Moravian minister at Salem, N. C., and Bethlehem, Pa.; noted botanist. *Specimen Floræ Americæ septentrionalis cryptogamicæ*, 1821; *Monograph of the N. American species of the genus Carex*, 1825.—His son, EDMUND ALEXANDER, D.D., 1825–1887, became a Moravian bishop 1870. *Moravian Manual*, 1859; *Life of Zeisberger*, 1870; *Hist. Unitas Fratrum*, 1885.—His son, GEORGE EDMUND, M.D., b. 1858, Prof. of Ophthalmology in Jefferson Medical Coll. 1892, is prominent as a practitioner and writer.

Schweitzer's Reagent. Solution of hydrated cupric oxide in ammonia, used as a solvent for cellulose.

Schweizer-Sidler, HEINRICH, 1815–1894. Prof. Zurich 1871; writer on Latin grammar.

Schwendener, SIMON, b. 1829. Swiss botanist. Prof. Basel 1867, Tubingen 1877, Berlin 1878. *Die periodischen Erscheinungen der Natur insbesondere der Pflanzenwelt*, 1856; *Untersuchungen über den Flechtenthallus*, 1860; *Die Algentypen der Flechtengonidien*, 1869.

Schwenkfeld, HANS CASPAR VON, 1490–1561. German reformer, denounced by Luther for alleged heresies; author of 90 books or tracts, collected in 4 vols. 1564–70. His views in part anticipated those of the Quakers. He endured persecution from all sides, as did his followers, mostly in Silesia and Swabia. Some went to Holland, some to England, and a remnant exists in Pa. as a distinct sect.

Schwerin, KURT CHRISTOPH, GRAF VON, 1684–1757. Prussian Field-marshal; prominent under Frederic II.; killed at Prague.

Sciadiaceæ. Sub-order of *Protococcoideæ.*

Scialoia, ANTONIO, 1817–1877. Prof. Turin 1846–48 and 1852; Minister of Finance 1865, and of Instruction 1872; writer on political economy.

Sciatica. Disease whose chief symptom is pain in the back of the thigh, constant and gnawing, with exacerbations or paroxysms. As the disease progresses, the area of pain extends along the course of the sciatic nerve even to the foot. It is of long duration, and may be the result of several conditions or brought about by different causes.

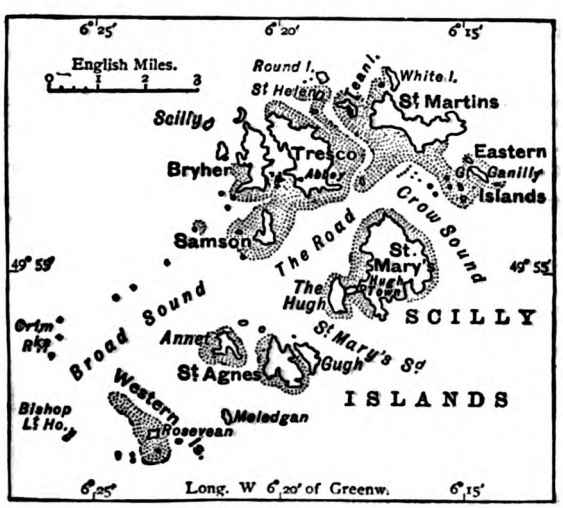
Science. Systematic knowledge, distinguished from philosophy in that it investigates the laws rather than the nature of reality. Its method is that of observation, classification, and explanation by hypothesis and verification; its causes are antecedent conditions of phenomena, and not metaphysical entities.

Science, CHRISTIAN. Scheme propounded in Mass. 1866–67 by Mary Baker Glover, now Mrs. Eddy, and set forth in her *Science and Health*, 1875, and other books. It denies matter, claims that "God is Mind, and All-in-all," and includes "Metaphysical Healing," which refuses to be identified with Faith-cure. An Association was formed 1876, a Ch. founded in Boston 1879, and a *Journal* begun 1883 by Mrs. Eddy. The movement had, in 1894, 300 societies, 26 teaching institutes, and 66 dispensaries. Some allege that its ideas were first mooted by Dr. P. P. Quimby, who d. 1865.

Science, MILITARY. The fundamental principles of the art of war, and their application to the problems of war in actual service. It embraces (1) strategy, including logistics, by means of which the time, place and character of battles to be fought promise the greatest advantage in case of success and the least injury in case of defeat; (2) logistics, discipline, grand and minor tactics, and military engineering, by means of which an army can make itself stronger than the enemy at the time and place of actual combat. The principles never change, but the art undergoes important modifications with the improvements made in the material of war.

Scientific Frontier. Imagined 1878 by Beaconsfield as possible and desirable between India and Afghanistan.

Scilly Islands. Group ab. 27 to 35 m. w. by s. of Land's End, Cornwall. The chief are St. Mary's, Tresco, St. Martin's,



Scilly Islands.

St. Agnes, and Bryher. Sir C. Shovel and 2,000 men of his fleet were drowned here 1707. Area ab. 3,500 acres, pop. ab. 2,500.

Scimiter. Short Turkish sword, intended for cutting, and therefore having a curved and sharp blade.

Scincoidea. See BREVILINGUIA.

Scinde. See SINDE.

Scintillation. Twinkling of the stars. Its cause is somewhat uncertain, but is probably due to irregular refraction of the atmosphere, combined with interference of light.

Scio. Anciently CHIOS (q.v.).

Scion, or CION. Shoot taken from a plant for grafting on another. See GRAFTING.

Scioppius, or **Schoppe,** KASPAR, 1576–1649. Student of German birth, whose energies were divided between classical learning and furious wordy wars against Protestants, Latin authors, Scaliger, James I., and others. He lived in Italy from 1618. *Grammatica Philosophica*, 1628.

Scioptic Ball. Hollow wooden ball which fits a socket in the window-shutter and is capable of being turned in different directions. Within it is a convex lens, by which images of outside objects can be formed in a darkened room.

Sciothericum Telescopium. Instrument devised by Molyneux for indicating the time, whether of day or night. It consists of a horizontal dial with a telescope adapted to it.

Scioto. River rising in w. central Ohio, and flowing e. and then s. to the Ohio at Portsmouth. Columbus and Chillicothe are on its banks. Length 210 m., drainage area 6,480 sq. m.

Scipio, PUBLIUS CORNELIUS, d. 211 B.C. Roman Consul 218; twice defeated by Hannibal in n. Italy; killed in Spain.—His

Tomb of Scipio, at Tarragona, Spain.

son and namesake, AFRICANUS MAJOR, 237–ab.183 B.C., was proconsul in Spain 210, took Nova Carthage, conquered the country, became Consul 205, carried the war into Africa, by victories there compelled the recall of Hannibal, whom he routed near Zama 202, made peace 201, and was honored as the greatest general of his time. He shared with his brother Lucius the victory over Antiochus 190. A later prosecution against him was defeated through popular clamor. He was brilliant, accomplished, magnanimous, and haughty.—His name came by adoption to ÆMILIUS PAULUS (AFRICANUS MINOR), 185–129 B.C., Consul 148 and 134. His chief exploits were the siege and destruction of Carthage 146, and of Numantia in Spain 133. Like his predecessor, he was a student and patron of letters.

Scire Facias. Common law writ founded on some record, as a judgment, recognizance or letters-patent, issued to enforce them or set them aside; generally superseded in U. S. by execution or by a motion.

Scirocco. Abnormally warm, moist, sultry southerly wind over Italy and Sicily, formerly erroneously supposed to come from Africa, or again to be the same as the Föhn, but now believed to owe its oppressiveness entirely to its moisture. See SIROCCO.

Scitaminaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 36 genera and 450 species, widely distributed through the warmer regions of both hemispheres, including the Banana, Ginger, and Arrowroot.

Sciuromorpha. Section of the order *Rodentia*, including Squirrels, Marmots, Beavers, Prairie-dogs, Woodchucks, Gophers, etc. They have complete clavicles, four lower molars, and five (sometimes four) upper ones. The molars are tuberculate in the Squirrels.

Sclater, PHILIP LUBLEY, F.R.S., b. 1829. English naturalist, writing especially on ornithology; ed. *Ibis* since 1860.

Sclerenchyma. Calcareous tissue composing the hard parts of corals. See also SCLEROTIC PARENCHYMA.

Scleres. Small mineral deposit of definite shape, in the protoplasm of cell colonies; *e.g.*, spicules of sponges. See SPICULE SYSTEM.

Sclerites. See SCLERODERMITES.

Sclerobasic. Coral secreted as a central axis by the bases of the polyps, as in Alcyonarians.

Sclerobasica. See ANTIPATHARIA.

Sclerodermata (MADREPORARIA). Group of *Zoantharia*, including the Madrepore Corals.

Sclerodermeæ. Family of Gasteromycetes.

Sclerodermi. See PLECTOGNATHI.

Sclerodermic. Tissue composed of Sclerites.

Sclerodermites. Calcareous spicules of the outer crust of sea fans. In the red coral they form a rigid skeleton.

Sclerotic Parenchyma. Vegetable tissue composed of short cells with greatly thickened walls, as in the grit-cells of the pear and the dense tissues of nut-shells.

Sclerotium. 1. Case containing spores and having a wall of tough material, half animal, half vegetable in nature, which protects the spores through a dry season; formed in the *Mycetozoa*. 2. Compact form of the mycelium of *Fungi*.

Sclerotoid. In Botany, structures resembling a sclerotium.

Sclopis, FEDERIGO PAOLO, COUNT, 1798–1878. Historian of Italian law, 1840–64; pres. Senate 1861–64; pres. Geneva Tribunal of Arbitration 1871.

Sclot, BERNAT. See D'ESCLOT, BERNAT.

Scoke. See POKEWEED.

Scolecida. Group of Vermes, including the ENTOZOA and ROTIFERS (q.v.).

Scolecite. Archicarp of certain *Fungi*.

Scolex. Tapeworm head, produced by budding from the walls of the cyst or bladder-worm in its first host.

Scollard, CLINTON, b. 1860. American poet; prof. Hamilton Coll. 1888. *Under Summer Skies*, and *On Sunny Shores*, 1895, describe his Eastern and Italian travels.

Scollops. See PECTINIDÆ.

Scolopacidæ (SNIPE). Family of Grallatores with long slender bill covered with soft sensitive skin. The legs are short in some forms, long in others.

Scolopendra. See CHILOPODA.

Scopas, d. ab.350 B.C. Greek sculptor and architect, associated with Praxiteles.

Scopoli, JOHANN ANTON, 1723–1788. Prof. Pavia 1777. *Flora carniolica*, 1760; *Introductio ad historiam naturalem*, 1777; *Fundamenta botanica*, 1783.

Scopularia. Form of spicule with four short tylote arms and one long needle-shaped arm; derived from a hexactine; present in the sponge *Eurete*.

Score. In Music, collocation of all the parts of a composition, *i.e.*, the voices, for the different performers; used by the conductor in studying a work and in directing its performance. The rule followed in bringing the parts together is to group the wind instruments of wood, flutes, oboes, clarionets, bassoons, etc., on the uppermost staves of the page, the brass instruments, trumpets, horns, trombones, etc., in the middle, with the drums above the trombones, and the strings on the lowest five staves. When voices are employed, their parts appear between those of the brass and string choirs. In the case of an opera or other work employing a number of singers and an orchestra, an arrangement showing the vocal parts intact and the orchestral part transcribed for pianoforte is called a vocal score.

Scorel, JAN VAN, 1495–1562. Dutch painter, active before the time of a distinct Dutch School; for some time in Rome, and historically important as a transmitter of Italian influence.

Scoresby, WILLIAM, D.D., F.R.S., 1789–1857. English explorer and scientist. *Arctic Regions*, 1820; *Journal*, 1823; *Magnetical Investigations*, 1839–52.

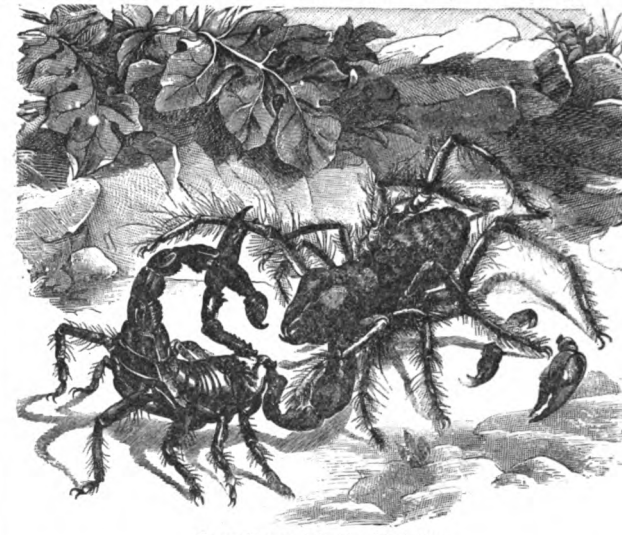
Scoriæ. Volcanic slags and cinders which are more or less porous, due to the expansion of the gases in the melted material.

Scorpio. See ZODIAC.

Scorpioid. In Botany, inflorescence of many plants in the natural family *Boraginaceæ* and some other plants. It is a false raceme, coiled in the bud (and hence also known as helicoid).

Scorpion Grass. See FORGET-ME-NOT.

Scorpionidea, or SCORPIODEA (SCORPIONS). Arachnids with chelate cheliceræ, foot-like chelate pedipalps, the abdomen divided into an anterior broad præabdomen of seven segments and a narrow post-abdomen of six segments, with poison spine at the hind end, and with four pairs of lungs on the præabdomen. They reproduce viviparously, the sting is fatal



Scorpion and Spider Fighting.

to small animals, serious to children, but not fatal to adult man. Ammonia applied to the sting is a good antidote.

Scorza. Variety of epidote sand found in the beds of some Transylvanian gold-bearing streams.

Scot, REGINALD, ab.1538–1599. English author. His *Discoverie of Witchcraft*, 1584, was far in advance of the time, and called forth answers from King James and many others.

Scotch Confession of Faith. Prepared by Knox Aug. 1560, in a preface and 25 articles; adopted by Parliament; confirmed 1567; standard till 1688, though displaced in effect by the Westminster Confession 1646–48.

Scotch Mist. Fine rain, whose particles of water are large enough to have a visible rate of descent and to slightly wet the surface of exposed objects.

Scotch Paraphrases. Pub. 1745 by a Committee of General Assembly; in number 45; little used; revised and enlarged 1781 to 67, with 5 hymns; appended to Scotch Psalms, and widely used.

Scotia. Concave molding, which, when seen from above, produces a strong shadow and is therefore commonly used in bases.

Scotists. Followers of Duns Scotus; largely Franciscans.

Scotland. Northern portion of the island of Great Britain and a part of the United Kingdom. The surface is hilly, becoming mountainous in the north. The coast is broken with numerous fiords and rocky islets. It was originally inhabited by Celts and was called Caledonia by the Romans, who subjugated only the s. portion. The Scots (Irish Celts) under Fergus invaded the Highlands 503 and founded a Scotch kingdom. Norwegians and Anglo-Saxons introduced Teutonic influences. William the Conqueror compelled Malcolm III. to do homage 1072. The effort of Edward I. to maintain supremacy was resisted by Wallace; Bruce achieved independence 1328. The Stuart dynasty began with Robert II. 1371–90. The contests over succession caused many troubles and a border feud raged intermittently along the English boundary. The enmity of England drove S. into close relations with France; royalty allied itself with the Church, and alienated the nobles, who, embracing Protestantism, were drawn toward England, and a reaction began against

Fall of Foyers, near Inverness.

France, represented in Mary of Guise, wife of James V. Their daughter Mary was educated at the French court and married the Dauphine Francis; thus the two crowns seemed on the point of being united. On the premature death of Francis, Mary returned, and, after many tribulations, was imprisoned and beheaded in England for conspiring against Elizabeth. Mary's son, James VI., succeeded to the throne of England 1603. His son and grandsons ruled both countries, but the two were not definitively united in Great Britain until 1707. Area 29,785 sq. m.; pop., 1891, 4,033,103.

Scotland, CHURCH OF. Established since 1557, with intervals of Episcopal intrusion under the Stuarts; model of Anglo-Saxon Presbyterianism everywhere.

Scotland, FREE CHURCH OF. Secession 1843 from the established Ch. on the right of congregations to a voice in choosing their ministers, embracing 470 out of over 1,200 ministers, and a third of the people.

Scotland, NATIONAL COVENANT OF. See NATIONAL COVENANT.

Scotland, UNITED PRESBYTERIAN CHURCH IN. Formed 1847 by union of the Associate and Relief bodies. See PRESBYTERIANS.

Scott, ANDREW, 1757–1839. Scottish peasant-poet.

Scott, CHARLES, 1733–1813. Col. 3d Va. regiment 1776, Brig.-gen. 1777; active in Pa., N. J., and N. Y., and against Indians 1791–94; Gov. of Ky. 1808–12.

Scott, DAVID, 1806–1849. Scottish historical painter and illustrator.—His brother and biographer, WILLIAM BELL, 1811–1890, was a poet, painter, and art-critic. *Lectures*, 1861; *Little Masters*, 1879.

Scott, DRED. See DRED SCOTT CASE.

Scott, ELIZABETH, ab.1708–1776. English hymnist, m. 1751 to ELISHA WILLIAMS (q.v.) of Conn.—Her brother, THOMAS, 1705–1775, pub. *Job in Verse*, 1771, and *Lyric Poems*, 1773. Two of his sacred songs are still in extended use.

Scott, SIR GEORGE GILBERT, 1811–1878. English architect, restorer or builder of 26 cathedrals; R.A. 1861, knighted 1872.

Scott, GUSTAVUS HALL, U.S.N., 1812–1882. Commander 1856, Captain 1863, serving on the Atlantic coast; Commodore 1869, Rear-admiral 1873.

Scott, HUGH S. See MERRIMAN, HENRY S.

Scott, JOHN MORIN, 1730–1784. Delegate to Congress 1775 and 1780–83; Brig.-gen. 1776–77; N. Y. Sec. of State 1777–79.

Scott, LEVI, D.D., 1802–1882. M. E. bishop 1852.

Scott, MICHAEL, 13th cent. Semi-mythical magician, said to have tr. works of Aristotle from the Arabic; mentioned in Dante's *Inferno;* prominent figure in border traditions and ballads; used by Sir W. Scott.

Scott, MICHAEL, 1789–1835. Scottish nautical novelist. *Tom Cringle's Log*, 1829; *Cruise of the Midge*, 1833.

Scott, ROBERT, D.D., 1811–1887. Prof. Oxford 1861; Dean of Rochester 1870; ed., with Dr. H. G. Liddell, a *Greek Lexicon*, 1845.

Scott, ROBERT HENRY, F.R.S., b. 1833 in Dublin. Head of British weather service 1867. *Meteorology*, 1883.

Scott, ROBERT KINGSTON, b. 1826. Brig.-gen. U. S. Vols. 1861–63; Gov. of S. C. 1868–72.

Scott, THOMAS, D.D., 1747–1821. English divine, practical commentator of the Evangelical School. His *Family Bible with Notes*, 1788–92, was widely circulated. *Works*, 10 vols., 1823–25.

Scott, THOMAS ALEXANDER, 1824–1881. Vice-pres. Pa. R. R. 1859; Asst. Sec. of War 1861–62; eminent in public services during the war; pres. Union Pacific R. R. 1871–72; pres. Pa. R. R. 1874–80.

Scott, SIR WALTER, 1771–1832. Scottish poet and novelist; Baronet 1820. Beginning with translations from the German, 1796, and ballads, he pub. *Minstrelsy of the Border*, 1802–3, and won fame by *The Lay of the Last Minstrel*, 1805; *Marmion*, 1808; and *The Lady of the Lake*, 1810. His other metrical romances are inferior, and Byron soon surpassed him in poetry, though many of his lyrics have a peculiar charm. His chief fame rests upon the brilliant series, largely historical, and long anonymous, of "Waverley Novels," 1814–31. Among the finest are *Guy Mannering*, 1815; *Old Mortality*, 1817; *Rob Roy* and *The Heart of Midlothian*, 1818; *The Bride of Lammermoor*, 1819; *Ivanhoe*, 1820; *Kenilworth*, 1822. His *Life of Bonaparte*, 1827, and other solid works are less memorable. He spent large sums on building Abbotsford, and in 1826 the failure of publishing firms in which he was a silent partner burdened him with an enormous debt: refusing offers of aid, he labored for its payment with a heroic energy which shortened his life. His character commanded general respect and affection; his influence was long paramount in English, French, and German fiction. Literary fashions have changed: judged by later standards, his style is loose, his plots sometimes careless, his history often inaccurate, his delineation limited to externals and lacking in psychologic depth and delicacy. For these reasons his works are less read than formerly, and little esteemed by realists; but they still have warm admirers, and

Sir Walter Scott.

fill a prominent place in the vast treasure-house of English literature. Their effect is visible in the recent revival of historical and romantic fiction by Conan Doyle, Weyman, Hope, and others. The vast popularity which caused each of Scott's novels to be eagerly awaited by thousands is a thing of the past; but he remains "the Wizard of the North" and master in his own field. His *Journal* was pub. 1890.

Scott, W. BELL. See SCOTT, DAVID.

Scott, WINFIELD, U.S.A., 1786–1866. Brig.-gen. 1814, Major-gen. 1815; prominent on the Canadian border 1813–14; General-in-chief of the U. S. Army 1841; leader in the war with Mexico 1846–47, which resulted in the cession of Cal. and New Mexico to the U. S.; Whig candidate for Pres. 1852; Brevet-lieut.-gen. 1855; retired 1861.

Scottish Language. This is n. English modified by Celtic and Scandinavian influences and, as spoken in Edinburgh from 1450, this was the literary language of Scotland. Wyntoun, Dunbar, Douglas and James I. are among the chief contributors to this literature. See ENGLISH LITERATURE.

Scotus, JOHANNES. See ERIGENA.

Scotus, JOHANNES DUNS. See DUNS SCOTUS.

Scourge of God. Title of Attila, king of the Huns; said to have been conferred by a hermit.

Scouring Rushes. Plants of the genus *Equisetum*, natural family EQUISETACEÆ (q.v.). The stems are rough from the abundance of silica in the epidermis, and are sometimes employed for scouring floors. *E. hyemale* is known also as Shave-grass.

Scour of Streams. Process of washing away a bed or bank by the current. A velocity of 1 ft. per sec. will move small gravel, of 2 ft. pebbles ab. an inch thick, and of 20 ft. stones 2 ft. in diameter.

Scranton. Capital of Lackawanna co., Pa., on the Lackawanna, in a region devoted to coal mining; settled 1840, chartered 1854 and 1866. Its industries consist mainly in the shipping of coal and the manufacture of iron and steel. Pop., 1890, 75,215.

Screen. In Architecture, any partition subdividing an apartment which is less than its entire height. It may be either solid or perforated, as in a rood-screen, which does not shut off the view, but merely marks the subdivision, and may be either of masonry or woodwork. In Gothic Architecture, screens were elaborately designed and carved, and often became features of architectural importance.

Screw. Right circular cylinder on the convex surface of which is a uniform projecting thread in the form of a helix. A cross section of the thread may be of several different forms, the rectangular and the triangular being commonest. The distance between two adjacent threads measured parallel to the axis of the screw is called the pitch. The screw is usually

used as a mechanical power to move a body through a small space with great force, as in the copying-press.

Screw-Gearing. Method of transmitting motion and power from one shaft to another by toothed wheels (see GEAR WHEELS), in which one or both has for its driving profiles the elements of a helix or screw. The shafts may be parallel, or not parallel and not intersecting. The former case is called transmission by helical gear; the latter is screw-gearing properly so called. In screw-gearing (sometimes called also worm-and-wheel), the velocity transmitted from one shaft to another does not depend on the relative radii of the worm and wheel, but the driving shaft which carries the screw moves the wheel in one revolution through an angle subtended by the pitch of the wheel, which is the same as the linear pitch of the screw; that is, the number of turns will be as the fraction $\left(\frac{1}{\text{no. of teeth of wheel}}\right)$. The wheel can drive the worm only when the pitch of the screw is so steep that the projected angle between the axis and the tangent to the helical elements is less than the angle of friction between the two surfaces of contact. Hence the adaptation of screw-gearing to hoisting machinery, since it can also hold the load when raised. The face of the worm wheel is often curved to the arc of the worm to give greater bearing surface, and the teeth elements made parts of the complementary helix to that of the worm.

Screw Pile. Iron pile furnished with screw blades at its foot, and sunk into the soil by turning it like a screw; used for foundations of lighthouses and ocean piers.

Screw Pine. Trees of the genus *Pandanus*, natives of the Malayan and Polynesian islands, producing a great abundance of aerial roots, forming structures of strange appearance.

Screw Pine.

Screw Turbine. Water wheel which moves by the pressure of water upon helicoidal blades attached to a vertical shaft. It is of low efficiency and but little used.

Screw-Worm. Larva of a green fly with red eyes, common in s.w. U.S., which lays its eggs in wounds, nostrils, etc., of man and other animals. The eggs hatch in a few hours into larvæ that bore into the flesh, making a putrescent, non-healing sore, and death ultimately ensues from blood poisoning. Carbolic acid should be applied, and the wound dressed with oil of tar and fish oil, to repel the flies.

Scribe, AUGUSTIN EUGÈNE, 1791–1861. French dramatist, producer, alone or in partnership with others, of some 250 plays, from one act to five; best in light comedy. He never attained greatness, but was very successful in meeting stage requirements.

Scribes. Jewish scholars who devoted themselves to transcribing and interpreting the Mosaic Law. Their influence was great and ultimately eclipsed that of the priests. Their casuistry and worship of the letter drew down on them our Lord's severest indignation.

Scribner, CHARLES, 1821–1871. Publisher in New York; founded *Scribner's Mag.* 1870, which became *The Century* 1881.

Scribonius Largus, 1st cent. Roman writer on medicine.

Scrivener, FREDERICK HENRY AMBROSE, LL.D., D.C.L., 1813–1891. Anglican divine, who wrote much on the N.T. and was one of its revisers; pensioned 1872.

Scrivener's Cramp. See NEUROSIS.

Scrobiculate. In Botany, pitted surfaces.

Scrofula. Constitutional condition manifested by the peculiar character of the processes of inflammation, particularly a degeneration of the lymphatic glands into cheese-like masses. The presence of Koch's bacillus of consumption in these products of inflammation makes it probable that it is a manifestation of tuberculosis.

Scroggs, SIR WILLIAM, ab.1623–1683. Chief-justice of King's Bench 1678; impeached 1680 for misconduct during the Popish Plot trials; pensioned.

Scroll. In Architecture, a spiral ornament often applied to consoles and like features. Its most common employment is in the Ionic capital, and when thus employed it is known as a volute.

Scrope, GEORGE POULETT, F.R.S., 1797–1876. M.P. 1883–68; born in London; best known for his *Volcanoes of Central France*, 1827. He studied the probable cause of their phenomena and their connection with the present state and past history of the earth.

Scrophulariaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising ab.175 genera and ab.2,500 species, distributed throughout all parts of the globe; called the Figwort family.

Scruple. In Apothecaries' Weight, $\frac{1}{3}$ of a drachm, $\frac{1}{288}$ of a lb. Troy, 20 grs.

Scruples of Conscience. Doubts as to what is right and what wrong in the case of special points in any given course of action.

Scud. Small detached clouds beneath any mass of clouds from which rain is falling; also called wrack.

Scudder, HORACE ELISHA, b. 1838. Biographer of Noah Webster, 1882, and (in part) of Bayard Taylor, 1884; author of *Dream Children*, 1863, and other juvenile books; ed. *Riverside Mag.* 1867–71, and *Atlantic Monthly* since 1890. *Man and Letters*, 1888.—His brother, SAMUEL HUBBARD, paleontologist of U. S. Geological Survey 1886–92. and ed. *Science* 1883–85, has pub. much on Entomology. — Their niece, VIDA DUTTON, b. 1861, pub. *Life of the Spirit in English Poets*, 1893.

Scudder, JOHN, M.D., 1793–1855. American missionary in Ceylon 1820–36, and at Madras; founder of schools and hospitals; father of ten more missionaries, of whom HENRY MARTYN, D.D., b. 1822, labored in India 1844–63, and wrote much in Tamil and Sanskrit.

Scudéry, MADELEINE DE, 1607–1701. French romancer, whose characters were real personages of her own time under ancient names; thus Condé is Artamène in *Le Grand Cyrus*, 1649–53. This and *Clélie*, 1654–60, bore the name of her brother GEORGES, 1601–1667, who furnished the plots; they filled 10 vols. each, as did her *Conversations*. Her works were once highly esteemed.

Sculptured Stone at Nigg, Ross-shire.

Scudo. Italian coin, equal to five lire or francs, and U. S. dollar; so named as originally bearing a prince's shield or coat of arms.

Sculling. The propelling of a boat by an oar placed over the taff-rail of a boat and plied from side to side; also applied to the rowing of boats, in which the oarsman uses a pair of sculls or short oars.

Sculpture. See the APPENDIX.

Sculptured Stones. General name given to a class of monuments of the early Christian period, many being unhewn stone with rude inscriptions or ornamental designs. Those of Scotland are mostly uninscribed, but usually decorated; one of the most ornate being at Nigg.

Scup. See PORGY.

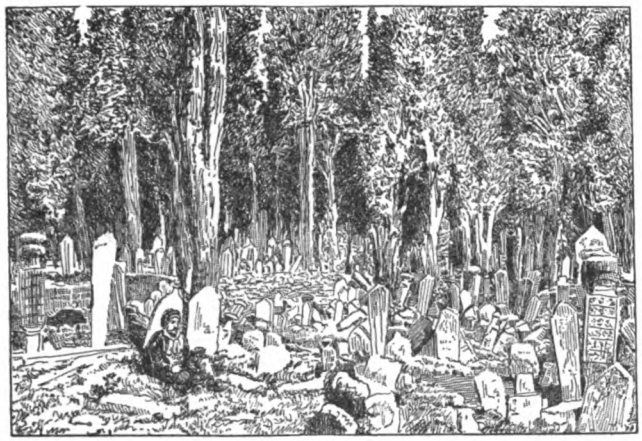
Scurf. In Botany, epidermal scales.

Scurvy. Constitutional disease characterized by great debility, with anæmia, spongy condition of the gums and a tendency to hemorrhages. It prevails among those who are forced to subsist for a long time on a diet which is lacking in fresh vegetables or their substitute. Hence it has been most prevalent among soldiers and sailors. The present precaution to provide the proper variety of diet for camps and vessels has made the disease a rare one. The juice of two or three lemons daily with plenty of fresh vegetables will suffice to cure, unless the disease is of long standing.

Scurvy Grass. Plants of the genus *Cochlearia*, ab. a foot high and having a small white flower. They have an acrid, biting taste and were of great benefit to sailors, before modern precautions against scurvy were known, for their antiscorbutic properties.

Scuta. Anterior ventral pieces of the shell of Barnacles.

Scutari. 1. Town of Asiatic Turkey, on the Bosphorus, opposite Constantinople; famed for its cemetery. Pop.



Cypresses in the Cemetery at Scutari.

ab.70,000. 2. Town of n. Albania, on Lake Suctari; besieged 1477 by the Turks, and soon after ceded to them. Pop. ab.35,000.

Scutate. In Botany and Zoölogy, shield-shaped organs.

Scutch-Grass. See GRASS, BERMUDA.

Scutellate. Diminutive of Scutate.

Scutellated. Tarsi and feet of birds when clothed with scutella. See SCUTELLUM.

Scutellum. In Botany, (1) shield-like cotyledon of certain grasses; (2) shield-shaped sessile apothecia in lichens.—In Zoölogy, piece between the scutum and the post scutellum in the dorsal part of the insect's thorax; (3) scales on a bird's foot.

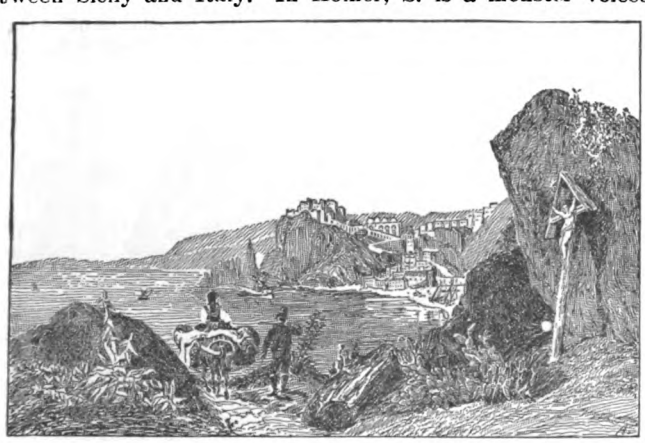
Scutes (OF SNAKES). Broad scales on the head and ventral surface of snakes. The labials line the margins of the jaws. The most anterior on the upper jaw is the rostral: this is followed in the median line by the anterior and posterior nasals, and the frontal, flanked on each side by the supra-ciliary; next come the parietals, and finally the many small occipitals. Between this series and the labials there are on each side the nasals, loreal, præorbitals, postorbitals, temporals, and occipitals. Behind the chin scute come the anterior labials, then a double series of mental scutes, followed by the small cervicals, and finally the ventrals under the belly. The number and arrangement varies in different species.

Scutibranchia. Broadly, Mollusks like the *Patellidæ* and *Aspidobranchia:* in a restricted sense, subdivision of *Aspidobranchia*, including forms like *Trochus*.

Scutum. In Zoölogy, largest piece, always present in the back (dorsum) of the insect's thoracic segments.—In Botany, ciliated, shield-like organs, especially the stigma of certain plants.

Scylax, ab.600 B.C. Greek of s.w. Asia Minor, who sailed from the Indus to the Red Sea. The *Periplus*, long credited to him, deals with a later and longer voyage.

Scylla and Charybdis. Two rocks in the strait between Sicily and Italy. In Homer, S. is a monster voiced



Rock and Promontory of Scylla.

like a dog, with 12 feet and 6 heads, which reach out and seize each a man from every passing ship. C., on the opposite side, absorbs and regorges the waters of the sea thrice every day.

Scyphistoma. Young polyp that arises from the egg through the planula and gastrula stages in discophorous Jelly-fish. It has 16 tentacles, the first 4 of which were produced successively.

Scyphomedusæ (ACRASPEDA, ACALEPHS). Large Jelly-fish with gastric filaments and covered sense organs on the lobed umbrella margin. The embryo develops through Scyphistoma, Strobila, and Ephyra forms, instead of hydroid stocks. The wide manubrium has 4 radial, oval arms or tentacles, often branched and sometimes fusing. The gastral filaments and generative organs are interradial in position. The sense organs are tentaculocysts. The groups included are *Lucernariæ*, *Peromedusæ*, *Charybdeidæ*, and *Discophora*.

Scythe. Long, sharp, curved instrument for cutting grass. The shorter and stronger kind are used for cutting bushes. The introduction of mowing machines has almost put away its use.

Scythia. Ancient name for the region extending n., e. and s. of the Caspian Sea and the Sea of Aral. It was used by the Romans to designate the savage tribes from those regions. Its boundaries were undefined.

Scythian. Sometimes called Turanian or Mongolian; family of languages comprising the Finnish and Hungarian, Samoyedic, Turkish, Mongolian proper, and Tungusic. Of all these, the last has the most meager development.

Scythians. Probably part of the Mongol race from the steppes of central Asia. They were nomads, expert horsemen and bowmen, and lived in covered wagons. The Scythia of Herodotus is, in the main, the s.e. parts of Europe. That of later Roman writers is the region e. of the Volga and w. of China.

Scytonemaceæ. Order of *Cyanophyceæ*, comprising forms with filaments divided by transverse septæ, the ends being alike.

Scytonemin. Brownish pigment contained in the cells of the *Scytonemaceæ*.

Sea. The sea covers 137,200,000 sq. m. of the 192,200,000 sq. m. comprising the earth's surface, or nearly three-fourths. Its mean depth is 12,480 ft. It is separated by land bodies into four great divisions, the Pacific (area 67,500,000 sq. m.), Atlantic (area 36,000,000 sq. m.), the Indian (area 28,700,000 sq. m.), and the Arctic oceans (area 5,000,000 sq. m.). A fifth division is sometimes added, comprising the southern parts of the first three, and known as the Southern or Antarctic Ocean. The differential action of the sun's heat upon the surface water of the sea produces currents, which, modified in direction by the earth's rotation and by the land outline, keep up a constant circulation. The specific gravity is ab.1.027, being greater than that of pure water, owing to the salts held in solution. The surface temperature is at the equator ab 80° F., in the Polar regions ab.28° F. In confined bodies near the equator it rises higher. At great depths it falls to 35° F., and is nearly constant in all latitudes. See OCEAN.

Sea, GREAT. In O. T., the Mediterranean, as opposed to the Dead Sea.

Sea, MOLTEN. Huge bronze laver in the court of the Temple of Solomon. It rested on twelve bronze oxen, and was used for washing the sacrifices. Capacity 17,000 gals.

Sea-Anemone. See ACTINIDÆ.

Sea-Bear. See FUR SEALS.

Sea Beggars. See BEGGARS OF THE SEA.

Seabury, SAMUEL, D.D., 1729–1796. First P.E. bishop in the U. S.; elected in Conn. 1783, consecrated at Aberdeen, Nov. 14, 1784.—His grandson, SAMUEL, D.D., 1801–1872, edited *The Churchman* 1831–49, and was prof. General Theol. Sem., New York, from 1862, where his son, WILLIAM JONES, D.D., b. 1837, became prof. 1873.

Sea-Cats. See CHIMÆRA.

Sea-Coast Artillery. Cannon of the heaviest caliber for the defense of harbors; that of the U. S. consists of the 8, 10, 12 and 16-in. caliber steel breech-loading rifled guns, and the 10 and 12-in. breech-loading rifled mortars. There are also some obsolete 15-in. smooth-bore cast iron Rodman guns, and some old 10-in. smooth-bore Rodmans converted into 8-in. rifled guns for the defense of secondary harbors.

Sea-Coast Carriages. Machines to maneuver the heavy guns by a small gun detachment. They are the barbette, to fire over the parapet; the casemate or turret, to fire through a port or embrasure; the disappearing, to fire over the parapet and to recoil under cover after discharge; and the mortar carriage.

Sea-Cow. See SIRENIA (*Cetacea-herbivora*), and MANATEE.

Sea-Cucumber. See HOLOTHUROIDEA.

Sea-Dove. See ALCIDÆ.

Sea-Elephant (MACRORHINUS ANGUSTIROSTUS). Large seals. The males attain a length of 20 to 30 ft., and have an

Sea-Elephant (*Macrorhinus leoninus*).

extensible proboscis. They inhabit the Antarctic and the American coasts of the Pacific, and are now scarce from over-hunting for their oil. See PHOCIDÆ.

Sea-Fan. See GORGONIDÆ.

Sea Fog. Fog driven by wind from the ocean over the land.

Seagrave, ROBERT, 1693–ab.1760. English hymnist.

Sea-Hedgehog. See PLECTOGNATHI.

Sea-Horse. See LOPHOBRANCHII.

Sea Islands. On s. coast of S. C.; noted for their superior cotton and large negro population.

Seal. At Common Law, impression on an adhesive substance, attached to a legal document. Its form and its legal consequences have been modified by modern statutes.

Seal. See SEALS.

Sea-Lavender. Species of *Limonium*, delicate salt-marsh herbs of the natural family *Plumbaginaceæ*, of wide geographical distribution; called also Marsh-rosemary.

Sea Laws. Early collections of maritime usages which had acquired the force of laws. Those of Oléron were received in England ab.1175; in Flanders ab.1350 or earlier. The Gothland (Wisby) sea laws may be traced back to 1240; an edition was printed at Copenhagen 1505, and they were accepted in Scotland before 1583.

Sealed Orders. In the navy, orders given to the commanding officer which are not to be opened until the ship has put to sea.

Sea-Lettuce. Various large light-green seaweeds of the genus *Ulva*.

Sea Level. Mean height of the surface of the sea when tranquil. If we suppose a canal cut across a continent deep enough for the waters of the ocean to enter and fill it, the surface would mark the sea level along its line. This surface, either of our supposed canal or of mid-ocean, does not of necessity conform to that of an ellipsoid, for in consequence of want of homogeneity of the earth, and of the attractions of continental masses, the waters are in a manner heaped up where the attraction is greatest and depressed where it is least. Thus the mean surface in mid-ocean is believed to be many feet lower than along the shores of the great continents. This difference cannot be determined instrumentally, for the instruments are affected in precisely the same manner as the surface of ocean.

Sealing-Wax. The Hindus from time immemorial were accustomed to use LAC (q.v.) for sealing manuscripts. A good sealing wax is made by melting together 48 parts of shellac, 12 of Venice turpentine, 1 of Peru balsam and 36 of vermilion. The introduction of gummed envelopes has, to a great extent, superseded the use of sealing-wax.

Sea-Lion. Breeding places and habits are much like those of fur seals. They are larger than the latter, and have only coarse hair as a covering. The male sea-lion of the n. Pacific (*Eumetopias stelleri*) attains a length of 14 ft. and wt. of 1,000 lbs.: the female is much smaller. They are invaluable to the subsistence of the Aleuts, who drive them overland to their villages, where they are slaughtered at leisure. The sea-lion most common off San Francisco is *Zalophus*. 9 ft. long. Other

Sea-Lion (*Otaria stelleri*).

species live in the temperate parts of the Southern Oceans. See OTARIADÆ.

Seal Islands. See LOBOS ISLANDS.

Seal of Confession. Obligation of a R. C. priest to reveal communications of a penitent to no human being without the consent of the penitent.

Seal of Solomon. In Magic, six-rayed figure, composed of two superimposed or interlaced triangles; frequently confused with the pentacle, which is employed as a defense against demons.

Seals. See PINNIPEDIA, WALRUS, SEA-LION, FUR SEALS and SEA-ELEPHANT.

Sealsfield, CHARLES (KARL POSTEL), 1793–1864. Austrian ex-monk, traveler and novelist, for some years in America. *Works*, 18 vols., 1846.

Seam. Relatively thin layer in a series of strata, strikingly different in appearance from the adjacent layers; *e.g.*, a seam of coal.

Seamen. Statutes generally require written contracts between sailors and their employers and contain various provisions for their protection; but while at sea they are subject to disciplinary punishment, not permitted in case of employés on shore.

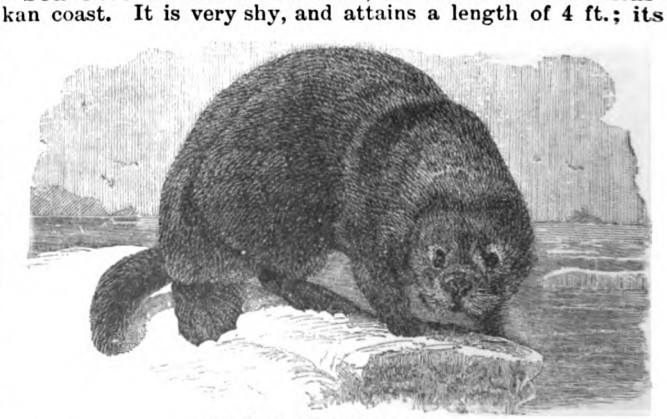
Seamen, MISSIONS TO. Begun in London ab.1812, and in New York 1818; since carried on by various societies in these and other cities, American, British, Scandinavian, and German.

Seamless Tube. Wrought-iron or steel tube, made without joints or seams: this may be done by forging it upon a mandrill, or by a special machine for hollow rolling.

Sea of Cortes. See CALIFORNIA, GULF OF.

Sea of Sodom. See DEAD SEA.

Sea-Otter. Valuable fur otter, hunted on islands off Alaskan coast. It is very shy, and attains a length of 4 ft.; its



Sea-Otter (*Enhydris lutris*).

hind feet are webbed. It feeds on clams, etc., and is said to sleep in the water, lying on its back, with its young clasped in its arms. It is monogamous, and bears but one young at a time,

but at no set season. Full growth is not attained until it is 5 yrs. old, but the fur is valuable after 2 yrs.

Search (AT SEA). Boarding a neutral vessel and examining her papers and cargo for the purpose of discovering whether she is violating her neutral duties.

Search Warrant. Judicial authority to search and seize persons or property. Its exercise is carefully regulated by constitutional and statutory provisions in the U.S.

Searles, WILLIAM HENRY, b. 1837. American civil engineer; author of *Field Engineering*, 1879; *Railroad Spiral*, 1882.

Sea-Rochet. Fleshy herbs of the genus *Cakile*, natural family *Cruciferæ*, natives of the sea-coast; of wide geographical distribution.

Sears, BARNAS, D.D., LL.D., 1802–1880. Prof. Newton Theol. Inst. 1836–48; pres. Brown Univ. 1855–67. *Luther*, 1850.

Sears, EDMUND HAMILTON, D.D., 1810–1876. New England divine, author of two greatly admired Christmas hymns. *Regeneration*, 1853; *4th Gospel*, 1872.

Sea-Serpents. Those now existing belong to the family HYDROPHIDÆ (q.v.), but those of the cretaceous period, the PYTHONOMORPHA (q.v.), realized the wildest imaginings of those who in modern times report having seen sea-serpents of unknown length and undescribed species. They were true air breathers. Some scientists think it possible that monstrous serpent-shaped fish may exist at great depths in the ocean, and possibly visit the surface at times.

Sea-Shore. At Common Law, space between ordinary high and low water mark. It belongs to the State or its grantee, except in Mass. and a few other States, where it is the property of the littoral proprietor.

Sea-Sickness. Well known nausea and discomfort produced by the motion of a vessel in rough water; or (car-sickness) the swing of a rapidly moving railway train. Its pathology is uncertain, but is possibly a disorder of the sympathetic nervous system. No certain cure has as yet been devised, despite the many suggested.

Sea-Snakes. See PROTEROGLYPHA and HYDROPHIDÆ.

Seasons, CHANGE OF. Due to the fact that the earth's axis is not perpendicular to the plane of the orbit, the angle being 66° 33′. When the earth is in that part of its orbit which causes the sun to appear above the equator, the result is summer; in the opposite case winter follows.

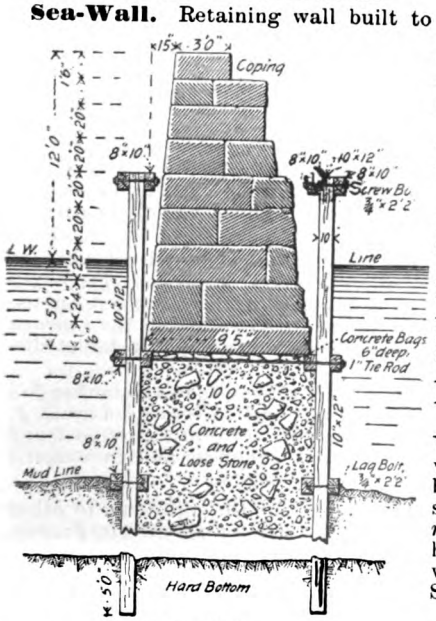
Sea-Swallow. See SOLAN-GOOSE.

Seaton, WILLIAM WINSTON, 1785–1866. Ed. Washington *Intelligencer* 1812–64; congressional reporter, with J. Gales, 1812–20. *Register of Debates*, 14 vols., 1829–37.

Seattle. Capital of King co., Wash., on an arm of Puget Sound; settled 1852, incorporated 1880; heavily injured by fire 1889; site of the State Univ. and several colleges. It exports large quantities of lumber, coal, fish, and grain; its manufactures are extensive and varied. Its recent growth has been rapid. Pop., 1890, 42,837, since much increased.

Sea-Urchins. See ECHINOIDEA.

Sea-Wall. Retaining wall built to prevent waves from washing away earth. The front is often curved to lessen the force of impact.



Sea-Wall.

Sea-Water. See WATER and SALT WATER.

Sea-Weeds. Marine plants of the class ALGÆ (q.v.).

Seawell, MOLLY ELLIOTT, b. 1859. American novelist. *The Berkeleys*, 1888; *Throckmorton*, 1890; *Maid Marion*, 1891; *Marsac*, 1896.

Sea-Worms. Worms living in salt water which eat timber; the most destructive one is *Teredo navalis*, which, however, is not a true worm, but a mollusk. See SHIP-WORM.

Seba. Ancient kingdom of Ethiopia or Abyssinia, not far from the cognate Sheba. See Ps. lxxii. 10.

Sebaceous Glands. Glandular organs distributed through the skin, except on the palms of the hands or soles of the feet, secreting an oily substance which, for the most part, discharges into hair follicles. This oily secretion is composed of stearin 24, extractin 12, salivary matter 11, albumen 24, calcium phosphate 20, calcium and magnesium carbonates 3.7, sodium chloride 3.7.

Sebacic Acid. $C_{10}H_{18}O_4$. Shining laminæ, mpt. 127° C.; obtained by the oxidation of stearic acid and spermaceti, and by fusing castor oil with caustic potash.

Sebaldus, ST. Patron of Nuremberg; canonized 1425. His history is legendary. His day is Aug. 19.

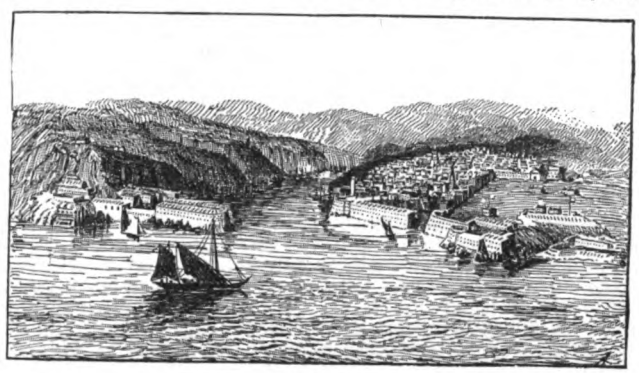
Sebastian, ST. Soldier of Gaul, martyred ab.287; depicted bound to a tree and pierced by arrows. His day is Jan. 20, and in the East Dec. 18.

Sebastian, 1554–1578. King of Portugal 1557. He took Tangier 1574, again invaded Africa 1578, and was defeated and slain Aug. 4 at Alcazar. His people believed him still alive, and five impostors personated him.

Sebastiani, FRANÇOIS HORACE BASTIEN, COMTE, 1772–1851. Corsican soldier and diplomatist, prominent in Napoleon's wars; General 1803, Marshal 1840.

Sebastiano del Piombo (LUCIANI). See PIOMBO.

Sebastopol, or SEVASTOPOL. Seaport of the Crimea, besieged by the allied armies of France and England Oct. 1854–Sept. 1855. 120,000 French and 27,000 English were engaged in the siege. The Russian works were garrisoned by ab.



Sebastopol.

30,000 men, and mounted 800 guns. The Russians lost 84,000 men, the French 44,500, the British ab. 15,000. Since its restoration the town is important commercially and as a summer resort. Pop. ab. 30,000, besides a garrison of 12,000.

Sebiferous. Wax-bearing organs, as the fruit of the Bayberry.

Sebillot, PAUL, b. 1843. French student of folk-lore; author of many books and papers on popular legends and superstitions, especially in Brittany.

Secant, IN GEOMETRY. Straight line which cuts a curve in two or more points, or plane which has two or more elements in common with a curved surface.

Secant, IN TRIGONOMETRY. Ratio of the distance of any point on the terminal line of an angle from its vertex, to the projection of that distance on the initial line of the angle.

Secchi, PIETRO ANGELO, 1818–1878. Director of the observatory at Rome 1850; eminent for scientific activity, particularly in solar physics and meteorology.

Secession. Voluntary separation from any body by some of its members; as, most eminently, that of the Southern States from the federal Union 1860–61. The doctrine had been anticipated by that of the S. C. nullifiers 30 years before.

Seckendorf, VEIT LUDWIG VON, 1626–1692. German official, author of *Deutsche Fürstenstaat*, 1656, and *De Lutheranismo*, 1688, the latter in answer to L. Maimbourg.—His nephew, COUNT FRIEDRICH HEINRICH, 1673–1763, was a general and diplomatist in the service of Austria and Bavaria, twice in chief command, and twice imprisoned.

Secker, THOMAS, D.D., LL.D., 1693–1768. Bp. of Bristol 1735, of Oxford 1737; Dean of St. Paul's, London, 1750; Abp. of Canterbury 1758. *Works*, 12 vols., 1795.

Secohm. See SELF-INDUCTION.

Second. $\frac{1}{86400}$th part of a mean solar day.

Second Advent. Final coming of Christ to judge the world; predicted in the Gospels. Many in all ages have expected it to occur speedily, and some have vainly fixed its date. See ADVENTISTS.

Secondaries. Quill-feathers (remiges) borne on the antebrachium (middle joint or section) of the bird's wing.

Secondary. In early geological science, all then known fossiliferous rocks; later, all strata containing extinct species of plants and animals; now nearly equivalent to Mesozoic.

Secondary, or SECONDARY CYCLONES. Small barometric depressions, usually marked by local rains or thunderstorms, and producing minor irregularities in the course of the general isobars.

Secondary Alcohols. Derived from methyl alcohol, $CH_3.OH$, by replacing two hydrogen atoms with two hydrocarbon radicals. Upon oxidation they yield a ketone, and then an acid or acids containing a smaller number of carbon atoms. They do not yield aldehydes. Example, secondary butyl alcohol: $CH_3.C_2H_5.CHOH$.

Secondary Battery. See ACCUMULATOR and STORAGE BATTERY.

Secondary Coil. See INDUCTORIUM.

Secondary Compounds. Formed by replacing hydrogen in a CH_2 group by a group or radical. Thus from propane, $CH_3.CH_2.CH_3$, secondary propyl alcohol, $CH_3.CHOH.CH_3$, is derived.

Secondary Generator. See TRANSFORMER and CONVERTER (ELECTRIC).

Secondary Roots. Those other than the PRIMARY ROOT (q.v.), appearing on various portions of the plant, as the climbing roots of the Ivy and Poison Vine, etc.

Secondary Sexual Characters. Any characteristics (as color markings, etc.), except those of the reproductive organs themselves, which distinguish males and females. An example is the spurs present on male fowl.

Seconds Pendulum. See PENDULUM.

Secret, DISCIPLINE OF THE. See ARCANI DISCIPLINA.

Secretaries OF STATE, WAR, ETC., OF U.S. These officials are appointed by the President and confirmed by the Senate. The salary of the office is $8,000 per annum. See CABINET.

Secretary-Bird (SERPENTARIUS). S. African, raptorial bird, with long legs (especially the tarsal portion), rather long neck and wings, and the two middle tail feathers much elongated. The back of the head bears a plume of backwardly

Secretary-Bird (*Serpentarius secretarius*).

directed feathers. The color is white in front and black behind. Length 4 ft., of which half is tail. They are not common. When pursued they run, though good flyers. They nest in tree tops. For food they prefer serpents: even those 5 ft. long are eaten.

Secretion. Production of definite fluid or semi-fluid substances by various organs of the body, more especially the glands, as their normal function; also, the substance so produced.

Secret Nailing. Boards so laid and nailed that the heads of the nails cannot be seen; also called blind nailing.

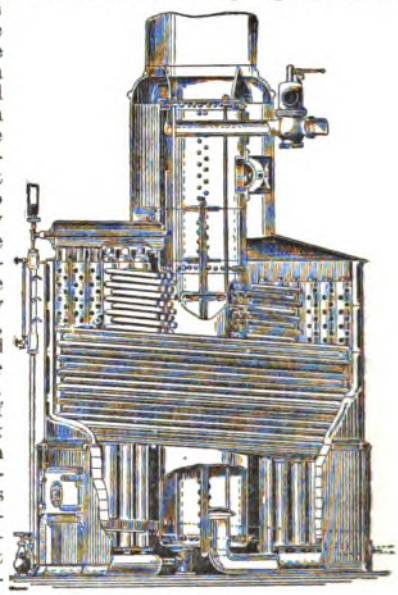
Secret Service Moneys. In England, funds placed at the disposal of the Ministers of State, to be expended at their discretion, without giving an account.

Secret Writing. See CRYPTOGRAPHY.

Section. In Architecture, an actual or imagined representation of a building or part of a building as it would appear if cut through at a certain line of the plan so as to expose its interior arrangement and construction. In important and complicated buildings, it is customary to prepare two drawings of vertical sections, one on the longer axis, called the longitudinal, and another at right angle to it, called the transverse section.

Section. Portion of surface included within lines of intersection with other surfaces. A plane section is formed by a plane cutting a surface.

Sectional Boilers. Form in which the generating elements are small and separate units, connecting together into one chamber, from which the outlets take off the steam. The units are spherical in cast-iron boilers, and of lap-welded tube in wrought-iron types. These boilers are portable when transportation is lacking for great weights; an accident to one part does not usually entail loss of the whole structure nor so appalling a disaster, since the water escapes gradually through a small outlet, and repair to the damaged part makes the whole boiler as good as before. The small diameters of the units insure quick transfer of heat through the thinner metal possible, whence the boilers are also light. The difficulties come from leakage of the increased joint area, from unequal expansion of different parts, and from insufficient disengagement area for steam from the water, whence wet steam and overheated metal will result, since the circulation will not be normal. In bad waters, also, scale will deposit in inconvenient places in such boilers. A sectional boiler is successful in proportion as it avoids or diminishes these difficulties. See BOILERS.



Sectional Boiler.

Sector, PLANE. Portion of plane surface bounded by an arc and the two radii or radii vectors at its extremities. Its revolution about the axis of the curve produces a solid sector.

Secular Acceleration OF THE MOON'S MEAN MOTION. Halley found, by comparing the ancient records of eclipses with those observed in the Middle Ages, and these in turn with modern observations, that a change was going on in the moon's velocity. This has since been shown to be due to the change in the eccentricity of the earth's orbit, and possibly in part to a lengthening of the day.

Secular Games. Supposed to be celebrated in Rome at the commencement of each Sæculum or period. From 249 B.C., a law made them obligatory every 100 years; but Augustus had this changed to 110 years. Horace wrote the *Carmen Sæculare* for this celebration, as is recorded upon a tablet discovered recently in Rome.

Secularism. Humanitarian scheme devised in London 1844, and pushed by local and national societies, led by G. J. Holyoake and later by C. Bradlaugh. It aimed at ethical and social improvement, on temporal grounds, and in a spirit essentially democratic and anti-theological.

Secularization. Conversion of Ch. property to other uses, as in England under Henry VIII., and later in France, Italy, and other countries; also transfer of authority, as over education and marriage, from Ch. to State.

Secular Perturbations OF COMETS AND PLANETS. Such as go on for ages in the same direction; distinguished from periodic, which complete their cycle in the course of a few years at most.

Seculars. 1. Priests not bound by monastic vows. 2. Bulk of Catholics, as living in the world and not following a special rule of piety beyond their necessary Christian obligations.

Secund. Axes of plants bearing lateral organs on one side only, or when these are all turned to one side, as the flower-heads in many kinds of Golden-rod.

Secundine. Inner coat of the ovule.

Secundus, JOHANNES (JAN EVERTS), 1511–1536. Dutch author of Latin poems. *Basia*, 1539.

Secundus, PUBLIUS POMPONIUS, 1st cent. Roman tragic poet, Consul 44. Fragments only remain.

Securite. Flameless powder, consisting of granulated yellow grains, composed of a mixture of 218 parts of dinitronaphthalene with 720 parts of ammonium nitrate.

Security. Property of any kind, set aside as the basis on which a loan is made, to guarantee the creditor's rights.

Sedalia. Capital of Pettis co., Mo., 95 m. e. of Kansas City; founded 1861. It has some manufactures. Pop., 1890, 14,068.

Sedan. Town of n.e. France, on the Meuse, near the Belgian border; seat of a Huguenot theol. sem. till 1685; scene of a momentous battle Sept. 1, 1870, following on a series of desperate conflicts in the vicinity, Aug. 29, 30, 31. It lasted from 5 A.M. to 4 P.M., and involved 150,000 French under MacMahon and 250,000 Germans under the king and crown prince of Prussia. 14,000 French were wounded and 25,000 made prisoners; Napoleon III. surrendered next day with 83,000 more, 70 mitrailleuses, and 550 cannon.

Sedan Chair. Covered vehicle borne on poles by two men, conveying one seated passenger; familiar in England ab. 1600–1800, and not yet entirely disused. It took its name from

A Sedan Chair.

Sedan in France, where it was invented. They were often decorated with paintings by artists of note. Similar chairs carried on the shoulders by two or more men have long been in use in China.

Sedatives. Medicines which directly depress the vital forces, the chief of which are aconite, chloroform and hemlock. The term is rather loosely employed.

Seddon, JAMES ALEXANDER, 1815–1880. M.C. from Va. 1845–47 and 1849–51; Sec. of War C.S.A. 1862–64.

Sedeno, ANTONIO. d. 1538. Spanish conqueror of the Caribs of Trinidad 1530, and later.

Sedentaria. Fixed, as distinguished from free-swimming animals, belonging to the same group; *e.g.*, the *Vorticellidæ*, a division of order *Peritricha* of ciliated Infusorians.

Sedentaria (ASCIDIÆ COMPOSITÆ). See ASCIDIACEA.

Sedentaria (TUBICOLÆ, CEPHALOBRANCHIA, CEPHALOBRANCHIATA). Polychætous Annelids that live in tubes. They have an indistinct head, which bears numerous thread-like tentacles and branched cirri, one of which may bear an operculum for closing the tube. They have a short proboscis, no jaws, and the branchiæ, parapodia, etc., are not largely developed. The body is often differentiated into thoracic, abdominal, and caudal regions. See ARENICOLA, CHÆTOPTERUS, SABELLA, and SERPULA.

Sedge. Grass-like plants of the natural family *Cyperaceæ*, growing mainly in wet places in all parts of the world.

Sedgemoor. In Somersetshire, near Bridgewater; scene of Monmouth's defeat by royal troops July 6, 1685, and the collapse of his rebellion.

Sedgwick, ADAM, LL.D., F.R.S., 1786–1873. English geologist, to whom we owe our knowledge of the true position and succession of the Paleozoic strata of Devon and Cornwall, of the geological relation of beds in n. and n.w. England, afterward called Permian, and of the general structure of N. Wales. Prof. Cambridge from 1818. He made the Woodwardian Museum one of the most complete in the kingdom.

Sedgwick, CATHERINE MARIE, 1789–1867. American novelist and author of tales for the young. *Redwood*, 1824; *Hope Leslie*, 1827; *Live and Let Live*, 1837; *Letters to my Pupils*, 1862.—Her father, THEODORE, LL.D., 1746–1813, was M.C. 1789–96 and 1799–1802, U. S. Senator 1796–99, and Judge of Mass. Supreme Court from 1802.—His grandson, THEODORE, 1811–1859, pub. *Measure of Damages*, 1847, and *Statutory and Constitutional Law*, 1857.—Their ancestor, ROBERT, d.1656, was a general under Cromwell.

Sedgwick, DANIEL, 1815–1879. London bookseller, whose collections, studies, and reprints supplied a nucleus and almost a basis for English hymnology.

Sedgwick, JOHN, U.S.A., 1813–1864. Brigade and division commander in the Army of the Potomac 1861–63; in command of the Sixth Corps Feb. 1863; distinguished at Fair Oaks, Antietam, Chancellorsville, Gettysburg and the Wilderness; killed at Spottsylvania.

Sedilia. In Ecclesiastical Architecture, the seats provided for the persons who take part in the performance of the service. They are sometimes incorporated with the walls and of the same material, but more often are movable and constructed of wood.

Sedimentary. Rocks formed by sedimentation.

Sedimentation. Settling down of rock material suspended in water.

Sedition. Acts or words tending toward treason, but not legally reaching its guilt and penalties. It tends to incite resistance to lawful authority. In the military service it is associated with mutiny, and military persons when found guilty of crimes of this nature by courts-martial are punished under the provisions of the Articles of War.

Sedley, SIR CHARLES, 1639–1701. English dramatist and poet.

Sedley, WILLIAM HENRY, 1806–1872. British-American actor.

Seduction. Illegal enticement of a servant from the master, especially that of a daughter and her sexual defilement; resulting in legal damage to the master: by statute often made a criminal offense.

Sedulius, CŒLIUS, ab.450. Latin poet, whose *Carmen Paschale* is chiefly a harmony of the Gospels. His hymn, *A solis ortus cardine*, is used in English versions.

See, APOSTOLICAL. Bishopric of Rome, as the only apostolically founded church in the West.

See, HORACE, b.1835. American designer of improvements in the engines of U. S. navy and other vessels.

Seed. Ripened plant ovule containing an embryo. The embryo is the essential part of the seed; the other structures are subsidiary to its protection, nurture, and germination.

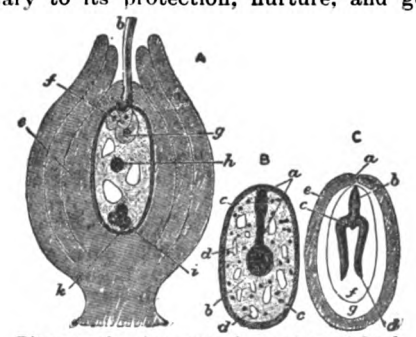


Diagram showing general structure of Seed.

A, section of ovule: *b*, pollen-tube; *e*, nucellus; *f*, accessory cells or synergidæ; *g*, ovum or egg-cell; *h*, central nucleus of embryo-sac; *i*, antipodal cells of embryo-sac; *k*, embryo-sac.
B, embryo-sac, showing *a*, suspensor; *b*, embryo or segmented ovum; *c*, nuclei; *d*, vacuoles.
C, section of a seed, showing *a*, the micropyle; *b*, embryo with embryonic root; *c*, embryonic stem; *d*, cotyledons; *e*, external seed-coat; *f*, endosperm; *g*, perisperm.

Seeds rich in ferment readily lose their power of germination; those rich in starch survive longest. See the various terms relating to the structure of seed above.

Seed-Bagging. Method of introducing and establishing a water-tight packing at any desired point in an artesian-, salt-, or oil-well, between the central tubing and the rock wall, by means of a strong bag fastened to the outside of the tube and filled with flaxseed. The seed, on swelling, adapts itself to the irregularities of the rock surface and thus prevents the downflow of water into the well's surface. Rubber and leather are also used.

Seed-Coats. Integuments of a seed, Testa and Tegmen.

Seedling. Young plant produced from a seed.

Seed-Vessel. Ripened wall of the ovary in plants; pericarp.

Seekers. English Puritan sect ab. 1650.

Seeland, or ZEALAND. Largest island of Denmark, opposite s. extremity of Sweden. Area 2,713 sq. m., pop. ab. 750,000.

Seeley, SIR JOHN ROBERT, 1834–1895. Prof. Univ. Coll., London, 1863, and Cambridge 1869; knighted 1894. His *Ecce Homo*, 1865, a book of great power and brilliancy, was anonymous, as was *Natural Religion*, 1882. *Roman Imperialism*, 1869; *Life of Stein*, 1879; *Goethe*, 1893; *Growth of British Policy*, 1896.

Seelye, JULIUS HAWLEY, D.D., LL.D., 1824–1895. Prof. Amherst Coll. 1858, and its pres. 1877–90; M.C. from Mass. 1875–77. *Christian Missions*, 1875; *Duty*, 1891.—His brother, LAURENS CLARK, D.D., b. 1837, was prof. Amherst 1865–74; organizer and pres. of Smith Coll. 1874.

Seeman, BERTHOLD, 1825–1871. German-English traveler and botanist. *Die Volksnamen der Amerikanischen Pflanzen*, 1851; *Botany of the Voyage H.M.S. Herald*, 1852–57; *Palms and their Allies*, 1856; *Die Palmen*, 1857.

Seer. Earlier name of prophets in Israel. I. Sam. ix. 9.

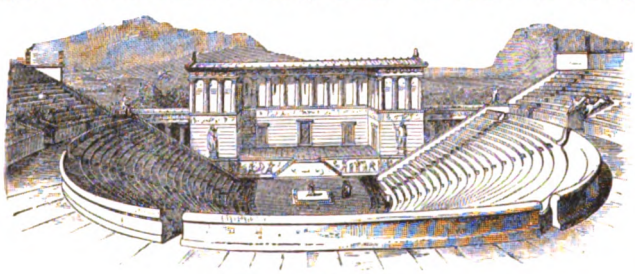
See-Saw. Children's sport, known to the Greeks; also called teeter. It consists of a reciprocal motion up and down of a balanced board on a support so placed that the ends may be occupied and swayed up and down. It is a common sport in Corea, where it is especially practiced by girls, and is known as "board jumping," the players standing erect on the ends of the board. It is also played in China and Japan.

See, the Conquering Hero Comes. Song composed by Handel for his oratorio *Joshua*, 1748, and afterward introduced in his *Judas Maccabæus*, an earlier work. It has won world-wide popularity, and is frequently heard as a greeting to a popular hero at celebrations.

Seetzen, ULRICH JASPER, 1767–1811. German explorer in Syria, Egypt, and Arabia. *Diary*, 1854–55.

Seewarte. German naval observatory, founded at Hamburg by Van Freeder 1867; reorganized 1875 by the German government under the admiralty, and devoted to every branch of marine meteorology.

Segeste. Ruined city of n. w. Sicily, held by Carthage, Syracuse, and from 206 B.C. by Rome. There are hot springs



Theater at Segeste.

near the site, which was 6. m. from the sea. The place now shows nothing but fine ruins, including a Doric temple and a theater.

Seggars. See PORCELAIN.

Segment. In Zoölogy, (1) ring-like parts or body-joints of an articulated animal; (2) parts of any organism which has become divided into pieces, as an egg (during early development and cell division) or a jointed limb.

Segment. One of two or more geometric magnitudes which added form a given whole. When direction is considered (indicated by + and — signs), either segment or both may in magnitude exceed the whole. In connection with specific forms, the term has limited meanings: a segment of a circle is limited by parallel chords; of a sphere, by parallel planes. Linear segments are limited by points, regardless of the manner of their determination. Surface and volume segments are limited by parallels.

Segmental Arch. One whose intrados is an arc of a circle less than ab. 70 degrees.

Segmental Organs, or DUCTS. 1. Tubes situated, a pair, usually in each segment of worms and other Invertebrates, and functioning as excretory organs (invertebrate kidneys or nephridia). 2. Tubules of the embryonic kidney of Vertebrates. See WOLFFIAN BODY.

Segmentation. See LOBATION.

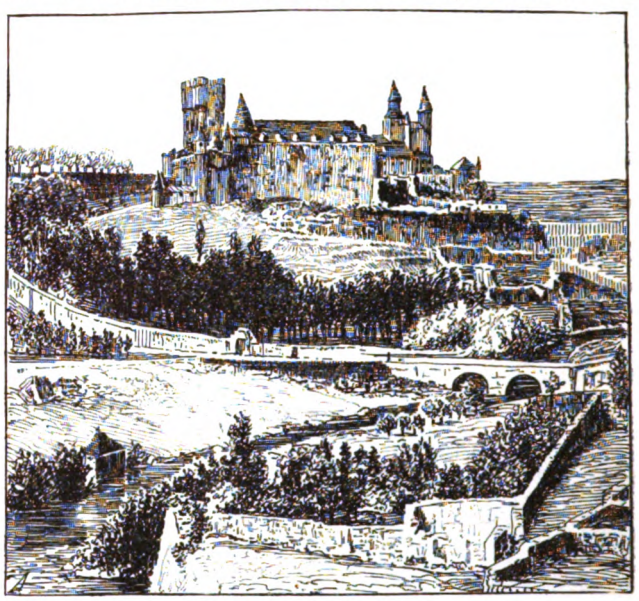
Segmentation. 1. Division into parts of equal rank, as when structures are repeated in the embryonic development of an animal (like successive rings of an articulated animal, vertebræ of Vertebrates, and joints of limbs). 2. Cell division in the egg, which leads to the formation of the blastoderm or a MORULA (q.v.).

Segmentation Cavity, or BLASTOCŒL. Space left between the cells (blastomeres) of the segmenting egg.

Segneri, PAOLO, 1624–1694. Italian Jesuit, eminent as a preacher. Some of his works, collected 1712, were tr. 1857–81.

Segner's Wheel. See BARKER'S MILL.

Segovia. Ancient city of central Spain, 32 m. n.n.w. of Madrid; important in the Middle Ages; pillaged by the French 1808. It has an old castle and a 16th-century cathedral. It is



Alcazar of Segovia.

surrounded by walls. The aqueduct which carried the waters of the Rio Frio into the city is the best specimen of Roman Architecture in Spain. Pop. ab.14,500.

Segregata. Order of the Linnæan class *Syngenesia* (natural family *Compositæ*), having a double involucre.

Segregated Vein. Body of mineral, or ore, resembling a true fissure vein in general form, but without the well-defined walls of such veins. It usually represents a local accumulation of mineral matter, a part or all of which may have been concentrated from portions of the adjacent country rock.

Segregation. Mass of ore of irregular shape, filling some previously existing opening, or derived from the surrounding rock.

Seguin, ÉDOUARD, 1812–1880. French physician, in U. S. from 1849; eminent for his treatment of the feeble-minded. *Éducation des Idiots*, 1839–43; *Idiocy*, 1866.

Segur, LOUIS PHILIPPE, COMTE DE, 1753–1830. French author, envoy to Russia 1783–88. *Galerie Morale et Politique*, 1817–23; *Mémoires*, 1825. His works, collected 1824–30, fill 33 vols.—His father, PHILIPPE HENRI, 1724–1801, and grandfather, HENRI FRANÇOIS, 1689–1751, were distinguished generals; his son, PHILIPPE PAUL, 1780–1873, wrote a notable account of the Russian campaign, 1824, histories of Russia, 1829, and of Charles VIII., 1835, and memoirs, 1873.

Segura, JUAN LORENZO, 13th cent. Spanish poet, author of an epic on Alexander the Great.

Seidl, ANTON, b.1850 at Pesth. Conductor, especially of Wagner's music; pupil and sec. of Wagner 1872–78; conductor in Leipzig, Bremen, and since 1885 in New York.

Seidlitz Powders. Composed of 120 grs. tartrate of soda and potash and 40 grs. bicarbonate of soda, inclosed in blue paper, and 38 grs. tartaric acid in a white paper. Each is separately dissolved in water, mixed, and taken while the effervescence is going on. They are so named from Seidlitz in Bohemia, which has a mineral spring of similar constituents. It acts as an aperient.

Seigniorage. Amount of metal deducted by government before coinage to pay expenses of the process; equivalent to the difference between the face value of the coin and the bullion value of the silver or gold contained in it.

Seine. River of France, heading in the e. part and flow-

ing n.w. through Paris to its mouth at Havre. Length 482 m., of which ab. 380 are navigable; drainage area 26,767 sq. m.

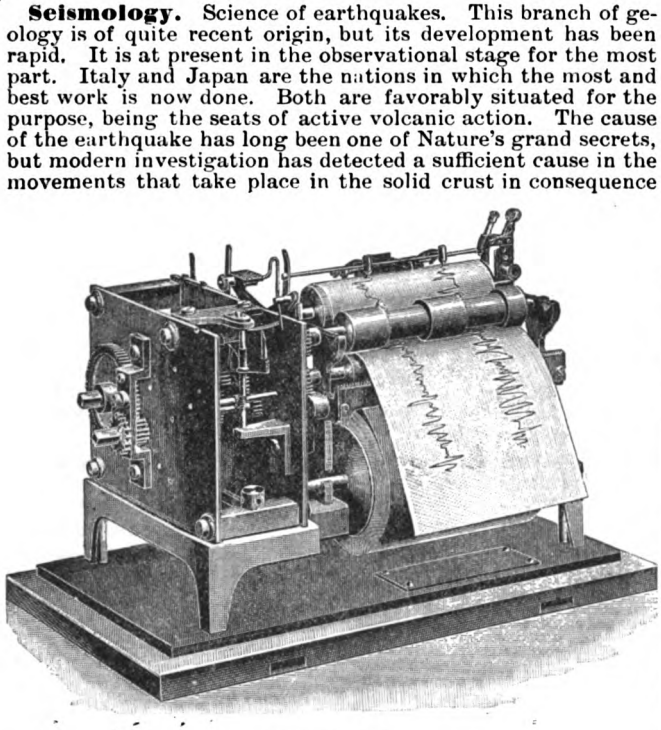
Seir. Mountain s.e. of Palestine, occupied by Edomites. See EDOM and ESAU.

Seirospore. Kind of spore developed in the necklace-like chains in some of the red *Algæ* or *Rhodophyceæ*.

Seisin. Possession of a freehold estate in land.

Seismograph. Instrument for recording the time of occurrence or direction of motion of any earth disturbance; *e.g.*, an earthquake or vibration caused by a distant explosion.

Seismology. Science of earthquakes. This branch of geology is of quite recent origin, but its development has been rapid. It is at present in the observational stage for the most part. Italy and Japan are the nations in which the most and best work is now done. Both are favorably situated for the purpose, being the seats of active volcanic action. The cause of the earthquake has long been one of Nature's grand secrets, but modern investigation has detected a sufficient cause in the movements that take place in the solid crust in consequence



Seismograph.

of contraction. The accumulating strains and stresses result at last in causing slips among the strata. The jar thus produced is propagated through the rocks in the form of a wave of small height but great length. In a recent earthquake, *e.g.*, the height of the wave was estimated at half an in. and its length as 28 m. The rate of propagation is usually ab. one m. per sec. Seismological observatories are now established in various parts of the world, and instruments of precision, whose principle is usually that of the pendulum, are employed to detect and register the intensity and direction of the shocks. See EARTHQUAKE.

Seismometer. Instrument for recording the intensity of any earth disturbance.

Seismoscope. Device for detecting the occurrence of any vibration or disturbance of the earth.

Seiss, JOSEPH AUGUSTUS, D.D., LL.D., b.1823. Pastor in Phila. from 1858; ed. *Prophetic Times*, 1863–75, and *Lutheran*, 1873–79; prolific writer. *Apocalypse*, 1869–81; *Miracle in Stone*, 1877.

Sejanus, ÆLIUS, d.31. Prefect of prætorians under Tiberius. He gained vast influence, aspired to imperial power, and had Tiberius' son Drusus poisoned, Agrippina and her sons banished. Tiberius, who had shut himself up in Capreæ, sent a letter to the Senate which resulted in his execution. His body was dragged through the streets and thrown into the Tiber.

Sekigahara. In Japan; scene of a battle. See DAIMIOS.

Selachii (SELACHEA, SELACHOIDEA, ELASMOBRANCHII, CHONDROPTERYGII; SHARKS). Fishes, with cartilaginous skeleton, a segmented, vertebral column, and undivided brain-capsule; with large paired fins and heterocercal caudal fin. The skin is shagreened with placoid scales, which in the transverse and ventrally placed mouth are transformed into several rows of characteristic teeth. There are five (sometimes six or seven) branchial pouches and clefts; also spiracles, which represent rudimentary hyoid clefts. There is no swim-bladder. A spiral-valve is present in the small intestine. The sense organs and brain are highly developed; the latter presents traces of convolutions. The heart possesses a muscular conus arteriosus, which contains several rows of valves. The pelvic fins of the male are modified to form copulatory organs. The eggs may be laid in a capsule, or be retained in the uterus, and then the fœtus may have a true placenta. Two sub-orders are included, *Holocephali* and *Plagiostomi*. See SQUALI.

Selachostomi. See CHONDROSTEI.

Selaginaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 9 genera and ab. 140 species, natives of all parts of the Old World, the tropics and Australia excepted.

Selaginellaceæ. Class of the heterosporous *Pteridophyta*, comprising the orders *Selaginelleæ* and *Isoeteæ;* also called *Ligulateæ*.

Selah. Term of common occurrence in the Psalms, probably indicating a pause, while the instruments played an accompaniment, as signified in the Septuagint translation, *Diapsalma*.

Selangor. Malay state, in the peninsula, n. of Malacca; under British protection since 1874; noted for its tin mines. Area ab. 3,000 sq. m.; pop., 1891, 81,592.

Selborne, ROUNDELL PALMER, EARL OF, D.C.L., b.1812. M.P. 1847–52, 1853–57, 1861–72; knighted 1861, made Baron 1872 and Earl 1882; Solicitor-gen. 1861, Atty.-gen. 1863–66, Lord Chancellor 1872–74 and 1880–85. He compiled the familiar *Book of Praise*, 1862, and pub. *Memorials*, 1896.

Selden, JOHN, 1584–1654. English antiquarian of great learning, imprisoned 1621 and 1629–31 for opposing royal encroachments; M. P. from 1623; lay member Westminster Assembly 1643. *Titles of Honor*, 1614; *De Diis Syriis*, 1617, partly tr. 1880; *History of Tithes*, 1618; *Mare Clausum*, 1635; *De Jure Naturali*, 1640; *Table-talk*, 1689.

Selection. See NATURAL SELECTION, SEXUAL SELECTION, and HYBRIDIZATION.

Selenates. Salts of selenic acid.

Selene. Greek moon-goddess, daughter of Hyperion and Theia.

Selenga. River of Mongolia flowing into Lake Baikal. Length 700 m.

Selenic Acid. H_2SeO_4. Liquid resembling sulphuric acid, unstable, readily passing to selenious acid; made by treating selenium with strong oxidizing agents in the presence of moisture; dibasic.

Selenides. Derivatives of hydrogen selenide or compounds formed by the direct union of selenium with some other element.

Selenious Acid. H_2SeO_3. Crystallized, deliquescent solid, made by dissolving selenium dioxide in water; dibasic.

Selenite. Variety of gypsum, that occurs in crystals or in foliated forms, transparent, and with a prominent pearly luster.

Selenites. Salts of selenious acid.

Selenium. Se. At. wt. 79, sp. gr. 4.5–4.8, sp. ht. 5.92, mpt. 217° C. for cryst. selenium, valence II., IV., VI.; discovered by Berzelius 1817. It occurs in two modifications. Soluble selenium is a brick red or black powder; non-conductor of electricity. Insoluble or metallic selenium is obtained by cooling melted selenium rapidly to 210° C. It crystallizes from carbon disulphide, like sulphur. Selenium occurs in small quantities in a number of sulphides, and is extracted from the flue-dust of sulphuric acid factories by treating with oxidizing agents.

Selenium Bromide. Se_2Br_2. Selenium monobromide. Dark-red liquid; sp. gr. 3.60, bpt. 225° to 230° C.; made by bringing bromine and selenium together in the proper proportions.

Selenium Dioxide, or SELENIUM ANHYDRIDE. SeO_2. Solid, crystallized substance, made by burning selenium; soluble in water, forming selenious acid. It has the odor of rotten radish.

Selenium Iodides. Compounds of the formulas Se_2I_2 and SeI_4 are known. They are wholly similar in properties to the BROMIDES (q.v.).

Selenium Monochloride. Se_2Cl_2. Transparent, dark-brown, oily liquid, decomposing on boiling; obtained by passing chlorine over heated selenium.

Selenium Nitride. Se_2N_2. Bright, orange-yellow, amorphous powder, soluble in benzene and acetic acid; made by dissolving the tetrachloride in carbon bisulphide and passing ammonia into the solution.

Selenium Tetrabromide. $SeBr_4$. Bright reddish-brown powder, crystallizing from carbon disulphide in dark orange-red crystals; volatile at ordinary temperatures; made by treating the monobromide with bromine.

Selenium Tetrachloride. $SeCl_4$. Bright yellow crystals which volatilize without melting; soluble in hot phosphorous oxychloride; made by treating selenium dioxide with phosphorous pentachloride.

Seleniureted Hydrogen. H_2Se. Colorless gas of an

unpleasant odor. It destroys the sense of smell temporarily, and is made by treating ferrous selenide with an acid.

Selenocentric. Pertaining to the center of the moon; *e.g.*, selenocentric place of a heavenly body, place as seen from the moon's center.

Selenodont Dentition. Teeth with the crowns adapted for grinding, as in the Ruminants. The ridges of enamel upon the crowns are disposed into crescentic lobes, the convexities of which are turned inward in the upper teeth and outward in the lower.

Selenodontia (RUMINANTIA). Section of artiodactyl (even-toed) Ungulates, whose molar teeth are adapted for cud-chewing and conform to the selenodont type. They have the metapodials united into a cannon-bone bearing four toes, the middle two alone reaching the ground. Molars are 6 times 4; upper incisors are absent, and frequently canines also. The stomach is differentiated into compartments to subserve rumination. See TYLOPA, TRAGULINA, PECORA, and CAVICORNIA.

Ravine of Seleucia.

Selenography. Description of the moon's surface, as geography is of the earth's.

Selenyl Chloride. $SeOCl_2$. Faintly yellow fuming liquid, solidifying below 0° to a crystalline mass which melts at 10° C.; bpt. 179.5° C. (cor.); decomposed by water; made by heating sodium chloride with selenium dioxide.

Seleucia. City on the Tigris, 40 m. n.e. of Babylon; built by Seleucus I.; important in first century; destroyed 165. Others of this name were in Syria and s. Asia Minor.

Seleucidæ. Syrian dynasty 312–65 B.C.

Seleucus I., NICATOR, d.280 B.C. General under Alexander; Satrap of Babylonia 321. The year of his recovery of Babylon from Antigonus, 312, was the starting-point of the era of the Seleucidæ, long used. He took the title of king 306,

Tetradrachmon of Seleucus I., Nicator.

and extended his sway to the Oxus and Indus. By 281 he was master of so much of Asia as Alexander had conquered. In 280 he made an attempt to gain the vacant throne of Macedonia, but was assassinated.

Self-Conceit. Unduly high opinion of one's gifts or abilities.

Self-conjugate Triangle, or SELF POLAR. One whose vertices are respectively the poles of the opposite sides in reference to a given conic.

Self-Consciousness. State or act of being aware of one's self. Many psychologists deny the existence of a direct sense of reaction or any immediate knowledge of anything but an object of knowledge. See CONSCIOUSNESS.

Self-Control. Habit of mind by which we resist the impulses of desire and affection, so as to conform to rules of virtue or prudence.

Self-Defense. See ASSAULT.

Self-denying Ordinance. Passed in Parliament at Cromwell's instance, April 3, 1645. It required "that no member of either House should, during the war, enjoy or execute any office or command, civil or military." Cromwell was made an exception.

Self-Development. Process of growth toward the highest perfection of which any given soul is capable.

Self-Esteem. Approval of one's own character, often, but not necessarily, exaggerated.

Self-Fertilization. That of the ovules of a flower by means of pollen from the anthers of the same flower.

Self-Heal. See HEAL-ALL.

Self-Induction. Faraday observed 1831 that on completing or breaking the current flowing in a helix an induced current is generated in a second wire wound outside the first. Henry showed 1832 that any variation in the strength of a current in a helix is also capable of inducing currents in the contiguous spires of the helix. The former is called MUTUAL INDUCTION (q.v.). The latter is called self-induction, as representing the action of a coil on itself. It is also called Inductance. The coefficient of self-induction, L, depends on the coil itself, and is sometimes called its INDUCTANCE (q.v.). Since the quantity of electrification is proportional to the flow of force, Φ, we may write $\Phi = IL$, I being the current strength, or $L = \Phi/L$; *i.e.*, this coefficient may be defined as the ratio of a flow of force to a current strength. Since the dimensions of Φ are $M^{\frac{1}{2}} L^{\frac{3}{2}} T^{-1}$, and those of I, $M^{\frac{1}{2}} L^{\frac{1}{2}} T^{-1}$, the dimension of inductance being the quotient is simply a length. Therefore in the C.G.S. system the unit coefficient of inductance is a centimeter. For practical purposes a QUADRANT (q.v.) has been adopted. Since an ohm is a quandrant per second (10^9 C.G.S. units), an ohm-second, or a secohm (so called by Ayrton and Perry), is the equivalent of a quadrant. In U. S. the unit coefficient of self-induction is called a Henry. See COEFFICIENT OF MUTUAL INDUCTION.

Self-Interest. One's own advantage considered as an end, as opposed to altruistic gratification.

Selfishness. Habit, principle, or instinct of making ourselves the principal object of our attention and solicitude.

Self-Love. Desire of one's own pleasure or gain, considered as an ethical end; almost identical with egoism.

Self-regarding Duties. Those the performance of which tends directly or indirectly to promote one's own happiness.

Self-Sacrifice. Virtue of one who willingly incurs pain or dispenses with pleasure to procure benefits for another.

Seligman, JESSE, 1827–1894. New York banker.

Selim I., 1467–1520. Sultan from 1512; conqueror of Syria, Egypt, and Arabia; head of Islam; noted for ability, energy, and cruelty.—II., 1524–1574. Sultan from 1566. His fleet sus-

Selim II.

tained a memorable defeat at Lepanto 1571.—III., 1761–1808. Sultan 1789–1807; deposed for attempting unpopular reforms.

Selinus. Greek city of s.w. Sicily, founded ab.625 B.C., taken by Carthage 409, destroyed 249 B.C. Its ruined temples are of great size.

Seljuks. Turkish-Tartarian tribe which arose in Turkestan; embraced Mohammedanism, absorbed neighboring tribes, and subjugated central and s.w. Asia, founding a vast empire. Bagdad fell 1055; the Greek Emperor Romanos was captured

1071; Asia Minor was subjugated 1074–84, whence the Crusades. The Sultanate of Iconium (Konich) was the starting point of the Ottoman dynasty.

Selkirk, or **Sealchraig**, ALEXANDER, 1676–1723. Scottish seaman, who lived alone on JUAN FERNANDEZ (q.v.), near Chili, 1704–9; afterward Lieut. R.N.; supposed original of Robinson Crusoe.

Selkirk, THOMAS DUNDAS, EARL OF, 1771–1820. Colonizer of Manitoba 1811. *Red River Settlement*, 1817.

Selkirk Mts. In s. British Columbia. Length ab.175 m., greatest elevation 9,940 ft.

Sellaite. MgF_2. Magnesium fluoride. Rare mineral occuring with sulphur and anhydrite near Montiers, France.

Sellar, WILLIAM YOUNG, 1825–1890. Prof. St. Andrews 1853, and Edinburgh from 1863. *Roman Poets*, 1863–81.

Sellers, COLEMAN, b.1827. American mechanical engineer, as is his cousin, WILLIAM, b.1824.

Selma. Capital of Dallas co., Ala.; on the Alabama, here navigable; important during the civil war. Pop., 1890, 7,626.

Selnecker, NICOLAUS, 1532–1592. German hymnist.

Selters. Cold acidulous springs near Limburg, Prussia. They chiefly contain carbonate of soda, chloride of sodium, sulphates of soda, lime, magnesia and iron, and much carbonic acid. They are refrigerant, tonic, diuretic, and aperient.

Seltzer Water. See SELTERS.

Selvage. Layer of clayey material, frequently found along the walls of metalliferous veins.

Selvas. Densely forested plains; especially the basin of the Amazon, which is covered with rich tropical forests.

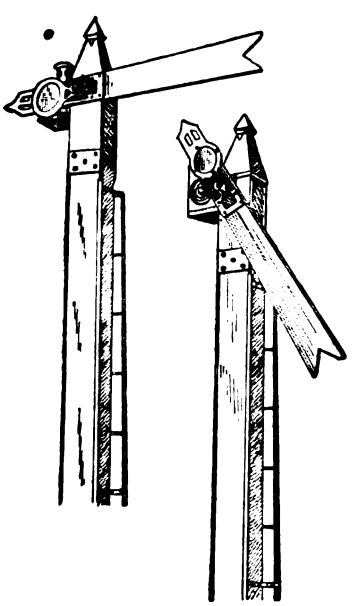
Selwyn, ALFRED RICHARD CECIL, F.R.S., b.1824. Chief of the Geological Survey of Victoria, Australia, 1852–69; since 1869 director of the Canadian Survey.

Selwyn, GEORGE, 1719–1791. English wit and social celebrity, M.P. from 1747.

Selwyn, GEORGE AUGUSTUS, D.D., 1809–1878. Bp. of New Zealand 1841, and of Lichfield 1867; eminent for missionary zeal and efficiency. His son, JOHN RICHARDSON, b. ab.1840, became Bp. of Melanesia, N. Z., 1872.

Semæostomeæ, or SEMOSTOMEÆ. *Discophora* with a large central mouth surrounded by four large, often multilobed, arms. The number of marginal tentacles, etc., varies greatly. *Pelagia* and *Aurelia* are examples. The former has wide gastric pouches and eight interradial marginal tentacles; the latter has branched radial canals, two marginal tentacles, and a fringe of small tentacles.

Semaphore. Device for producing signals by the various positions and motions of a set of arms which may be viewed from the distant station by a telescope. A similar method is employed for signaling between ships at sea, the arms being replaced by colored lights. The railroad signal presents the appearance of a horizontal arm when set "at danger." When lowered at an angle of 45 degrees it indicates "caution"; when vertical, "safety."



Semaphore at "Danger." Semaphore at "Caution."

Semele. Daughter of Cadmus, beloved by Zeus, who, at her rash request, visited her in his terrible splendors. She was consumed by the lightning, but her unborn child Dionysus was saved by the god.

Semi-Anthracite AND **Semi-Bituminous.** Varieties of coal whose properties place them between the true anthracite and the true bituminous coals. See COAL.

Semi-Arians. Those who, denying, with the Arians, that Christ is of one substance with the Father, maintained that He is of like substance; prominent at the Synod of Ancyra, 358. The compromise, being distasteful to both Arians and Catholics, gradually disappeared.

Semicircular Deviation. Deviation from its normal position, produced upon a magnetic needle by vertical masses of iron or steel magnetized inductively by the earth. The phenomenon occurs on shipboard in the case of the compass needle. In swinging the ship around there are two positions in which the influence would be a maximum, and two in which it would disappear; hence the name.

Semicolligati. Grallatory feet of birds, having one toe behind and three in front, of which the middle and outer are united by a short web.

Semi-cubical Parabola. Curve of the third order, having, with the origin at the vertex, the rectangular equation, $y^2=2px^3$.

Semi-diameter OF SUN AND MOON. Angle subtended by the radius as seen from the earth. Mean semi-diameter of the sun, 16′ 02″; of the moon, 15′ 33″.5.

Seminal. Anything pertaining to seeds.

Semini, ANDREA, ab. 1525–1591. Painter of the Genoese school, who imitated Raphael. Most of his works are at Genoa

Andrea Semini.

and Milan.—His father, ANTONIO, ab.1485–1547, was a pupil of Brea, whose style he modernized. His *Nativity*, at Savona, is in the style of Perugino.

Seminoles. Appalachian Indians of Muscogee stock, who lived in n. Florida. They differed from the allied Creek Indians in being hunters rather than agriculturists. Those now in Indian Territory number 3,000.

Seminole War. On the cession of Florida to the U. S., 1823, the Seminoles agreed to retire to the interior and not to molest the settlers. A treaty was made with some of their chiefs 1832 providing for the removal of the tribe to lands west of the Mississippi River. In 1835 troubles began, the treaty being repudiated by Osceola, whose wife was stolen and enslaved. Hostilities continued for several years. Osceola was captured 1837 under a flag of truce, and imprisoned: the tribe was driven into the everglades. In 1839 the chiefs signed another treaty, and after much delay were removed to the Indian Territory.

Semipalmati. Swimming feet of birds that have three anterior toes, webbed half way, and a posterior toe.

Semi-Pelagians. School teaching that the Fall has weakened but not extinguished man's capacity for good, and that, though needing grace, he can co-operate with it; condemned 529, though its founder, CASSIANUS (q.v.), is in several dioceses honored as a saint.

Semiplumæ. Feathers that possess stiff stems like the pennæ and soft vanes like the plumulæ, as do most of those beneath the contour feathers in birds.

Semiramis. Legendary queen of Ninus, founder of Nineveh, after whose death she built great cities and opened roads in all parts of the empire, conquered Egypt and most of Ethiopia, but failed in an attempt on India; famed for her voluptuousness. The legend combines historical and mythical elements in inextricable confusion. She is said to have built a tomb for Ninus 10 stadia wide and 9 high, the city of Babylon, the hanging gardens, etc. Most of the stupendous works in Iran and by the Euphrates seem to have been ascribed to her.

Semitæ. See FASCIOLES.

Semites. Name given by J. G. Eichorn, 1787, to designate

a group of nations closely allied in manners, physical features and religion, who are descended from Shem.

Semitic Languages. Most important group outside the Indo-European. Its divisions are well marked. Syrian and Assyrian make up the Aramaic; Hebrew and Phœnician, the latter scantily represented, but giving us the priceless boon of the alphabet, are closely related; while Arabic, with related dialects, forms a third and important group. Oldest of the records are the famous cuneiform inscriptions; of literature, most venerable in every way are the Hebrew Scriptures. In like manner, the Koran practically begins Arabic literature.

Semitic Races. Supposed descendants of Shem; Hebrews, Syrians, Mesopotamians, Arabs, Abyssinians, and some others, so far as originally speaking languages akin to Hebrew.

Semler, JOHANN SALOMO, 1725–1791. Prof. Halle from 1752; precursor of biblical criticism, moderate rationalist, and voluminous writer.

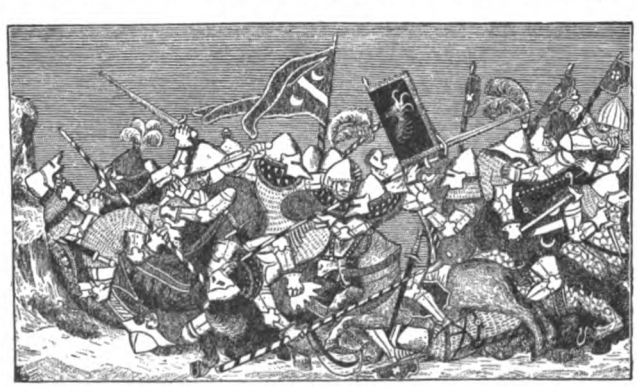
Semmering. Mountain of Austria, 60 m. s. of Vienna; ht. 4,416 ft.; traversed by a railway to Trieste, built 1850–54.

Semmes, RAPHAEL, U.S.N. and C.S.N., 1809–1877. Commander of the *Alabama*, most destructive of Confederate cruisers, from Aug. 1863 till her destruction by the *Kearsarge* off Cherbourg June 19, 1864. See WINSLOW, JOHN A.

Semnopithecidæ. Family of *Cynomorpha* or dog-like Apes, having long tails, natal callosities, but no cheek-pouches. The fore limbs are shorter than the hind, progression on the ground is quadrupedal. Here are included, first, the genus *Semnopithecus* of s.e. Asia, including the Entellus or Sacred Monkey of the Hindus, and the Proboscis Monkey of Borneo, with its greatly prolonged nose; second, *Colubus* of Africa, which differs from Semnopithecus in having a still shorter or rudimentary thumb.

Semolina. Middlings of wheat, or flour thereof, used in Italy. France, and elsewhere, for soups and desserts.

Sempach. Village of Switzerland, 9 m. n.w. of Lucerne. Here, July 9, 1386, 1,300 Swiss peasants defeated with great



Battle at Sempach.

slaughter Leopold, Duke of Austria, and the flower of his chivalry, 4,000 horsemen, thus securing Swiss freedom. See WINKELRIED.

Semper, GOTTFRIED, 1803–1879. German architect, prof. Zurich 1856–69.—His nephew, KARL, 1832–1893, prof. Würzburg from 1866, pub. books of travel and on zoölogy.

Sempringham. See GILBERTINES.

Sen, KESHUB CHUNDER, 1838–1884. Hindu reformer; founder of the Brahmo Somaj of India, 1866.

Sénancour, ETIENNE PIVERT DE, 1770–1846. French author, notable for deep and sincere melancholy long before pessimism came into fashion; overlooked in his productive period, and of chiefly posthumous repute. His *Obermann*, 1804, called forth two of Matthew Arnold's finest poems.

Senarmont, HENRI HURRAN DE, 1808–1862. Prof. in Paris School of Mines; eminent as a crystallographer; author of many papers of much scientific value.

Senarmontite. Sb_2O_3. Antimony oxide, crystallizing in the isometric system; usually regarded as a product of alteration of the antimony sulphide, and not often found by itself in quantity to pay for working. Valentinite is a mineral of the same chemical composition, crystallizing in orthorhombic forms.

Senate. Supreme administrative council of ancient Rome, dating from the time of the kings. It proposed legislation to the assemblies of the people, took measures against sudden danger, and, through the annual magistrates, governed the state. Its functions were nearer those of a ministry than of a legislature. The members held office for life, unless removed by the censor, or, in later times, by the emperor.

Senate OF THE U. S. This consists of two Senators from each State, a total of 88 in 1897, who are elected by the State Legislatures for terms of six years. They receive $5,000 per annum, 20 cents a mile for traveling expenses to and from home, and $125 per annum for stationery. See CONGRESS OF THE U. S.

Senebier, JEAN, 1742–1809. French naturalist. *Sur l'influence de la lumière solaire*, 1782–83; *Expériences sur l'action de la lumière solaire dans la végétation*, 1788; *Physiologie végétale*, 1800.

Seneca, LUCIUS ANNÆUS. 3 B.C.–65. Roman courtier and Stoic philosopher, one of the most brilliant men of his time; in banishment 41–49; tutor of Nero, and reluctant adviser of some of his misdeeds; Consul 57; self-executed by Nero's order, opening the veins of his feet and arms in a hot bath. As a moralist his intentions and sympathies were good, but his practice fell much below his theories; his character lacked the strength, consistency, and noble simplicity of his great successors in Roman stoicism, Epictetus and Marcus Aurelius. His prose works have often been edited; some were tr. ab.1680 and later. His nine tragedies follow Greek models.—His father, ANNÆUS, ab.54 B.C.–39, a rhetorician from Spain, wrote several treatises, of which five books of *Controversiæ* survive.

Seneca Lake. In w. central N. Y.; length 36 m. n. to s.

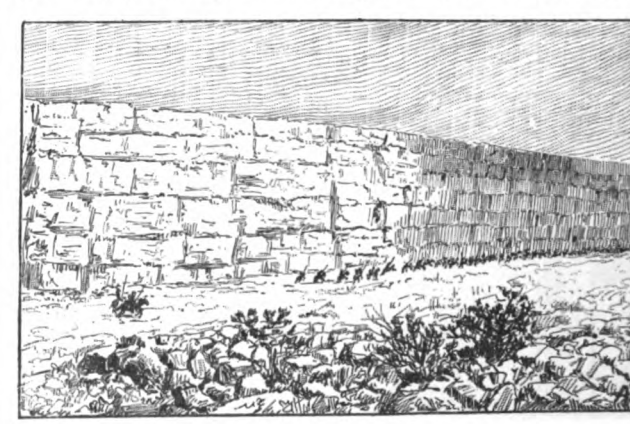
Seneca Oil. Small quantities of surface petroleum, collected in early days in w. N. Y.

Senecas. See HURONS and IROQUOIS.

Senefelder, ALOYS, 1771–1834. German printer, inventor of lithography. *Lehrbuch*, 1818, tr. 1819.

Seneffe. Town of Belgium, 27 m. s.w. of Brussels; scene of two French victories, that of Condé over the Prince of Orange, Aug. 11, 1674, and that of Marceau over an Austrian force, July 2, 1794.

Senegal. River of w. Africa, rising in the Kong Mts. and flowing n.w. to the Atlantic. Length ab. 1,000 m. The country is very picturesque, resembling in its physical features all



Rock Scenery of Upper Senegal.

sorts of architectural forms, ruined castles, spires and pyramids; so much so, that it oftentimes is necessary to approach quite close to satisfy one's self to the contrary.

Senegambia. Region of w. Africa, between the Sahara and the Gambia, held in part by France since ab.1600, and more fully since ab.1855; area and pop. uncertain.

Senegambians. The natives are numerous tribes of negroes, some Mohammedans, others fetichists. Arabic is spoken n. and e. of the Senegal and a Berber admixture is there present. On the coast and s. of the Senegal are the Wolofs, tall, glossy black negroes. In the center are the Mandingoes, Mohammedans, muscular, tall, and very cruel. In the s. are the gentler Fulah, also Mohammedans, of a reddish complexion and with straight hair, of Hamitic descent. Most of the negroes are polygamists; circumcision is widely practiced. A few hold the land; the rest are slaves.

Senescence. See OLD AGE, DISEASES OF.

Seneschal. Household servant of the Frankish kings, corresponding to the English steward.

Seney, GEORGE INGRAHAM, 1826–1893. Banker in New York; founder of a hospital in Brooklyn: benefactor of colleges, etc.; former of a noted collection of paintings, dispersed 1884.—His father, JOSHUA, 1750–1799, was in Congress from Md. 1787–92.

Senesino, FRANCESCO BERNARDI, ab.1680–ab.1750. Opera singer; artificial mezzo soprano; in London 1720–35.

Senft, KARL FRIEDRICH FERDINAND, 1810–1893. German mineralogist and geologist, teacher of natural sciences at Eisenach. *Synopsis der Mineralogie und Geologie*, 1876–78.

Senior, NASSAU WILLIAM, 1790–1864. Prof. of Political Economy at Oxford 1825–30 and 1847–62. Author of lectures, parliamentary reports, and essays. *Journals*, 1868–71; *Conversations*, 4 vols., 1878–80.

Seniority. Priority of rank in the military service, so that no doubt shall arise as to which officer shall command the troops.

Senlac, BATTLE OF. See HASTINGS.

Senlis. Old town of France, 33 m. n.n.e. of Paris. A treaty signed here, May 23, 1493, between Maximilian and Charles VIII. of France, settled the Burgundian inheritance.

Senna. Dried leaves of *Cassia*, imported from India and Egypt, and variously prepared for use in medicine.

Cassia obovata.

Sennaar. Former African state of e. Soudan, largely between Blue and White Nile, held by Egypt 1820–84, and since by the Mahdists.

Sennacherib, d.681 B.C. King of Assyria 705 B.C.; son of the usurper Sargon; famous as a conqueror, but defeated in his siege of Jerusalem under Hezekiah; assassinated by two of his sons. Many inscriptions and other relics of his are extant.

Sensation. Simple mental element; phenomenon of mind brought about by stimulation of an afferent nerve, transmitted to the sensory center, the brain. It has two marked aspects, the presentative, which gives us information as to the external object responsible for the sensation, and the affective, which indicates the elementary feeling tone which accompanies every sensation. Sensations are of two general classes, common and special. Common sensation is not dependent apparently upon specially modified end organs, and refers to such comparatively vague phenomena as tickling, nausea, and thirst. It has thus little of a definitely presentative character, and affords little knowledge of the external world, but is of considerable importance as an indication of the condition of the body. Special sensation, on the other hand, is dependent upon specially modified sense organs, and is distinctly presentative. The special senses are those of sight, hearing, taste, smell, skin senses (touch and temperature), and the muscle and joint sense. The most important characters of sensation are intensity, quality, extensity, and duration.

Sensationalism. Theory of knowledge which derives all abstract conceptions from associated sensations; opposed to intellectualism, which supposes an original and independent action of the understanding, supplying data and functions not found in either sensation or association.

Sensation Areas. Areas of skin of more or less circular shape, within which two points (as of compasses) pressed upon the skin are felt as one. Their magnitude varies with the different parts of the body, and corresponds to the fineness of sensibility of the region, being smallest on the tip of the tongue and largest on the back.

Sense. Sum of the simple mental states brought about by the stimulation of a particular sense organ. The experience of one sense differs qualitatively from that of another. See SENSATION.

Sense Capsules. Cartilaginous boxes or skeletons that form around the ear and eye in the vertebrate embryo. That around the ear incloses the essential organ of hearing (inner ear), and is closed except for three perforations; viz., foramen for the auditory nerve, foramen ovalis, and foramen rotundum.

Sense of Duty. Feeling of approval and acceptance of the propriety of fulfilling our obligations and duties.

Sense of Responsibility. Recognition that we have to answer for our actions, whether they are conformable to or in violation of the rules of duty.

Sensitive Flames. When a jet of gas issuing from a fine vertical opening under a considerable pressure is on the point of flaring, it is sensitive to certain sounds, as the rattling of keys or the sound of the letter s, the flames shortening and roaring as shown in the experiments of Prof. Tyndall. Barratt showed also that if the flame be lighted above a sheet of wire gauze arranged horizontally about two inches above the jet, the flame, which is luminous only at the tip, is a sensitive flame and responds readily by sinking down to the gauze when certain sound waves strike it. If it be surrounded by a wide tube, it will sing spontaneously. By delicate adjustment, as shown by Geyer, such a device may become extraordinarily sensitive to all very high sounds, such as hissing or rattling of keys, and also to certain sounds too acute to be perceptible to the ear.

Sensitiveness. That quality of a physical instrument in virtue of which it gives its indications quickly. A thermometer with a small bulb of cylindrical form is sensitive.

Sensitive Plant. Plants of the natural family *Leguminosæ* which fold or droop their leaves on being shocked. *Mimosa pudica* is the one most commonly cultivated. *Cassia nictitans* of the Middle and Southern States is slightly sensitive.

Sensitive Plant (*Mimosa pudica*).

Sensitivity. Ease with which a body yields to any outside influence; especially in thermometers, where it is indicated by a numerical coefficient, sometimes awkwardly called the coefficient of sensitiveness. It is the reciprocal of sluggishness or retardation.

Sensualism. Low conception of morality, which makes the pleasures of sense the chief end of man.

Sentence. Final judicial decision, especially in a criminal case.

Sentiment. High form of emotion attaching to ideal objects. Sentiments may be classified as intellectual, æsthetic, ethical and religious.

Sentiment of Rights. Feeling of pleasure in contemplating a regard in another for the rights of ourselves or of others.

Sentiment of Wrongs. Feeling of indignation roused by a violation of rights, whether our own or others.

Sentinel. Armed soldier, posted under the orders of an officer of the guard, to keep a watchful outlook within the limits of his post, and to carry out his orders with unswerving fidelity. During the night no one can approach the post of a sentinel without challenge, nor pass without the countersign. Sleeping on post in time of active service is punishable with death.

Senussi. Moslem society of austere and fanatical doctrines, with ramifications all over N. Africa; it has helped much in uniting the Mohammedan population and in resisting foreign and infidel influence.

Seoul. Capital of Corea, since ab.1600; near the center of the kingdom, on the Han-Kiang; founded 1397; closed against aliens till recent years; taken by Japanese 1894. Pop. ab. 250,000.

Sepalody. Change of the petals of a flower to sepals.

Sepals. Divisions of the calyx of a flower.

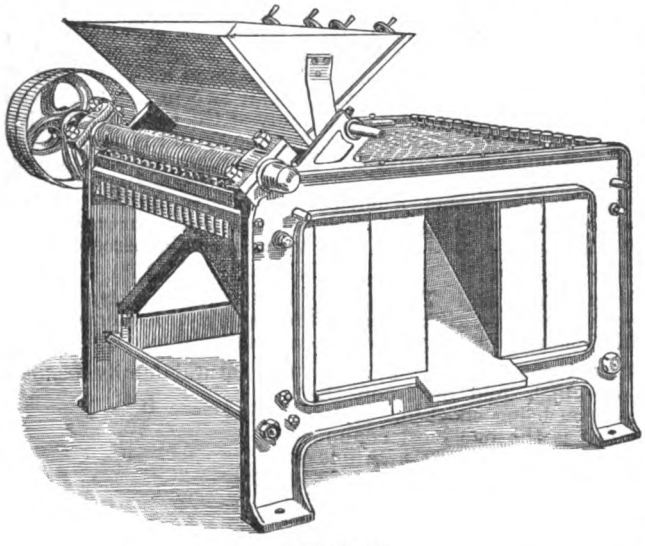
Separate Baptists. Denomination which sprang up in New England, due to Whitefield's preaching; they separated from the churches of the Standing Order. Ab. 1750 a large number again joined the Baptist Church. In 1895 there were 24 churches, with ab.1,600 members in U. S.

Separate Lutherans OF PRUSSIA. Name given to those Lutherans who refused to comply with the order of Frederick William III., uniting the Reformed and Lutheran Churches.

Separate Touch. One of the three principal methods of magnetization; first used by Gowin Knight (1713–1772), 1745. It consists in drawing the two opposite poles of a pair of equal magnets from the middle to the opposite ends of the

bar to be magnetized. The process must be repeated several times and on the different sides of the bar.

Separator. Mechanical apparatus of several types, differing in mode of construction; used in the concentration of ores,



Separator.

and designed to effect a separation of coarser and lighter from finer and heavier grains of ore with the aid of water.

Sepher Yetzirah. Book of Formation, or Creation, commonly regarded as the oldest book of the Jewish Kabbalah and attributed by tradition to Abraham. The date of its actual authorship is disputed. Critical authorities assert that it belongs to post-talmudic time. It consists in an exposition of the relations assumed to exist between small whole numbers, the letters of the Hebrew alphabet and certain divine truths. Its meaning is extremely obscure.

Sepia. Cephalopod of the division *Decapoda* and sub-group *Calciphora*, differing from the Squid mainly in that the pen or internal skeleton is calcareous, of a broad shape, of spongy texture, has chambers in its apex, and is known as a sepiostaire. The body is plumper than in squids: the lateral fins extend sometimes the entire length of the body.

Sepiolite. See MEERSCHAUM.

Sepiostaire. Cuttle bone of *Sepia; i.e.*, internal skeleton or pen of cuttle-fishes.

Sepoy. Native of India serving in the British army. The Sepoy Mutiny occurred 1857–58, when the natives in the army outnumbered the Europeans nearly 6 to 1. The present ratio is about 2 to 1.

Septa. Partitions, plate-like structures, especially those that stand (like spokes in a wheel) around the wall in the coral cup.

Septamerous. Flowers whose parts are in cycles of sevens.

Septate. In Botany and Zoölogy, organs or organisms separated by diaphragms or membranes into a series of cavities.

Septata. See GREGARINIDÆ.

September. Seventh Roman month, and the ninth month in the Gregorian calendar.

Septembrists. Murderers of over 1,300 royalists and others in Parisian prisons Sept. 2–7, 1792.

Septicemia. Disease characterized by a general fever caused by the absorption of poisonous products of inflammation, or of the microbes themselves, into the blood, but without a distinct suppurating wound. The fevers produced by an unremoved blood-clot in a wound, or by a dissecting wound, are examples. See BLOOD POISONING and PYEMIA.

Septicidal. Dehiscence or splitting of a seed-vessel into its constituent carpels, *i.e.*, through its septæ or dissepiments, as in Laurel.

Septifragal. Dehiscence or splitting of a seed-vessel, so that the valves of the pericarp break away from the dissepiments, as in Morning Glory.

Septimania. Ancient district in the s.w. of France, taking its name from its seven cities: Toulouse, Agen, Bordeaux, Poitiers, Saintes, Angouleme and Perigueux.

Septuagesima. Third Sunday before Lent.

Septuagint. Greek version of O. T., probably made in Egypt ab.260 B.C. The legend says it was done in 72 days by 72 learned Jews imported from Jerusalem by Ptolemy Philadelphus. It is unequal and free, in parts differing widely from the received Hebrew text, but is of great historical importance.

Septum. In Botany and Zoölogy, a membrane or diaphragm separating two cavities.

Sepulveda, JUAN GINES, ab.1490–1574. Spanish humanist, tutor of Philip II. His *Historia Caroli V.* and other works were pub. 1780.

Sequence. Unrhymed and unmetrical Latin hymn, sung after the Epistle; introduced by Notker ab.900.

Sequence. Quantities in succession, whose relations are undetermined or disregarded, form a sequence, as distinguished from a series. A sequence becomes a series whenever the relation between its terms becomes known or is considered.

Sequin. Gold ducat of Venice, 13th century and later.

Sequoia. Genus of trees, consisting of two species; *S. sempervirens*, the Redwood, and *S. wellingtonia*, the Mammoth tree. The latter is found in comparatively few places, the largest being found in Calaveras, Cal. Trees 112 ft. in circumference at the base, 450 ft. high, and estimated to be 1,100 years old, have been found.

Sequoia wellingtonia—the "Three Graces."

Sequoyah (GEORGE GUESS), ab. 1770–1843. Cherokee, who, on learning that the white man's book represented spoken words by printed symbols, invented ab.1826 an alphabet for his own people, partly phonetic and partly syllabic, using the Roman letters and arbitrary symbols, 85 characters in all.

Seraglio. Old palace of the Sultan of Turkey; improperly applied to that portion inhabited by the women of the imperial court. It is not now occupied by the Sultans; the Harem is here. It was once used to designate any inclosure, as the Jews' Ghetto at Rome.

Serao, MATILDE. See SCARFOGLIO.

Serapeum. 1. Sanctuary near Memphis, Egypt, where the Apis-bulls were buried; now covered by sand; a collection of temples and tombs, explored by Mariette 1851–55. 2. Temple at Alexandria, which contained a library of ab.50,000 vols.

Seraphim. Order of heavenly beings described symbolically by Isaiah, vi. 1–7.

Seraphim, ORDER OF. Founded in Sweden ab.1285, suppressed ab.1610, revived 1748.

Seraphine. Musical instrument which was the precursor of the Harmonium. The sounds were produced by the action of wind on free vibratory reeds.

Serapis. Deity of the Egyptian pantheon, regarded as a combination of Osiris with the bull Apis, sacred to Ptah. His principal temple, the Serapeum, was at Memphis, where the Apis-bulls were buried in stone sarcophagi in rock-hewn chambers. His worship spread from Alexandria over the Asiatic coast, the Greek islands and mainland, and was introduced at Rome along with that of Isis. He was lord of the lower world, and thus identified with Pluto or Hades; also, god of healing. His emblem was a bull with the sun-disk and sacred serpent, token of supreme power, between his horns. His bust in the Vatican shows a corn-measure, symbol of the nether world.

Serenade. Music performed in the open air on a clear or serene night, especially a concert given by gentlemen in a spirit of gallantry, under the windows of ladies. Formerly much in vogue in Italy and Spain, and still so in German and other university towns.

Sereth. River rising in the s. of Austria and emptying into the Danube above Galatz. Length 300 m.

Serfdom. Institution in which laborers, though without freedom of settlement or occupation, yet practically possessed property and contributed to the national wealth directly, as well as through their lords. It was abolished in England before 1600, and latest in Russia, where emancipation was proclaimed March 3, 1861, to be completed within 2 years. The number thus set free was 23,000,000. The serfs on the imperial domains had been liberated by Nicholas 1842.

Serge. Twilled fabrics, usually made of wool, but sometimes of silk. Silk serge is used for linings and woolen serge for cloaks.

Sergeant. Non-commissioned officer appointed by the colonel of a regiment from the enlisted men: he ranks next above a corporal. From the sergeants the colonel selects one, the color-sergeant. Commissary-sergeants are selected by the Sec. of War to assist with the stores. A lance-sergeant is a corporal temporarily assigned to the office of sergeant. A quartermaster-sergeant is appointed by the colonel to assist the quartermaster. His rank is next below that of the sergeant-major, who is the senior non-commissioned officer of the regiment: the duties of the latter are to keep the duty roster of sergeants and corporals, to transmit to them the adjutant's orders, and to supervise the proper proportion of men from the several companies for details of the day. The orderly-sergeant is the first sergeant of a company, and his duties require him to supervise the roll-calls, to maintain the discipline of his company, see to the execution of the orders of his captain and to carry out his wishes in the management of his men.

Sergeant, ADELINE, b. 1851. English novelist. *Jacob's Wife*, 1880.

Sergeant, JONATHAN DICKINSON, 1746–1793. Delegate to Congress 1776–77; Atty.-gen. of Pa. 1777–80.—His son, JOHN, 1779–1852, was M.C. 1815–23, 1827–29, and 1837–42, and a leader of the Phila. bar.—His brother, THOMAS, 1782–1860, was justice Pa. Supreme Court 1834–46. *Land Laws of Pa.*, 1838.

Sergi, GIUSEPPE, b.1841. Prof. Bologna 1880, and Rome 1884; writer on psychology.

Sergius. Patriarch of Constantinople 610–641; author of a hymn in praise of the Virgin.

Sergius, ST. Martyr at Cæsarea 304.

Sergius, TYCHICUS, d.835. Reviver of the Paulician sect; persecuted by Byzantine emperors.

Sergius I. Pope 687–701.—II. 844–847.—III. 904–911.—IV. 1009–12; first to assume a new name with the papacy.

Sergius Paulus. Proconsul of Cyprus, converted by St. Paul. Acts xiii. 7, 12.

Serial Homology (HOMOTYPY). Structural likeness between corresponding parts of one individual; *e.g.*, its metameres, appendages, etc. Thus in man the wrist bones are serially homologous with those of the ankle.

Sericite. Variety of Muscovite mica, characterized by a peculiar silky luster; one of the components of the sericite schists found in some parts of Europe. See MICA.

Sericteria. Spinning glands of insect larvæ, either in the position of the salivary glands, or else sacs attached to the rectum.

Series. Quantities in sequence related by some known law. Series are convergent in which the sum of the first n terms approaches a constant limit, as n increases. They are increasing or decreasing as the terms are successively greater or less. The most familiar series are difference, recurring, and harmonic. Specific series are named from their relation to special functions, as logarithmic.

Series. In Botany, row or circle of parts, as the bracts of the involucre in *Compositæ*.

Seringapatam. Former capital of Mysore, s. India; besieged by the British 1791 and 1792; taken by storm, and Tippoo Saib killed, May 3, 1799; once populous, now mainly ruined. Pop. ab. 12,000.

Seringe, NICOLAS CHARLES, 1776–1858. Prof. in Lyons 1829. *Mélanges botaniques*, 1818–31; *Elémens de botanique*, 1841; *Flore des jardins*, 1847–49.

Serna, JOSÉ DE LA, 1770–1832. Spanish general in Peru 1816, viceroy 1821; defeated by Sucre Dec. 1824.

Serotinous. Plants or flowers which develop late in the season.

Serous Membrane. Tissue whose use is to diminish the friction of the movement of the various parts of the body. It is always a closed sac, one side enveloping the moving organ, *e.g.*, the lungs; the other side, the walls of the cavity in which the organ moves, the thorax. This arrangement causes the inside of the sac to glide over itself, which it is enabled to do easily by its polished surface kept moistened by a serous secretion.

Serpa Pinto, ALEXANDRE ALBERTO DA ROCHA, b.1846. Portuguese explorer of Africa 1877–79 and 1884–86.

Serpent. Obsolete instrument forming the natural bass of the ancient cornet family. It was invented by Edme Guillaume of Auxerre in 1590.

Serpent Charming. Art practiced in the East from remote antiquity. In India the profession is hereditary. Serpent charmers of the East have a power of knowing where a serpent is concealed, probably distinguishing the musky smell which the serpents generally emit. They accompany their words with strange whistling sounds; what the tones of their voice may effect is uncertain. The serpents erect themselves

Indian Serpent Charmers.

partially, and in this position perform strange movements to the sound of a pipe on which the charmer plays.

Serpentine. $MgSiO_3.H_2O$. Mineral and rock. In composition it is essentially a hydrous magnesium silicate. Though there has been considerable speculation among geologists as to its origin, it may be regarded, in general terms, as a product of the alteration of magnesian minerals. It occurs in many distinct varieties, but is usually amorphous, of dull green or reddish color, and about as hard as common limestone. It takes a good polish, and is used considerably for building purposes. The so-called noble or precious serpentine is a bright green, translucent variety, of some value as an ornament.

Serpents. See OPHIDIA.

Serpent Worshipers. See OPHITES.

Serpula. Tubicolous Annelid worm, whose body is divided into a thorax and an abdomen. The head is provided with a collar: on each side of the mouth are two spirally coiled plates, bearing gills. It lives in little crooked tubes attached to sea-shells, rocks, etc.

Serpula contortuplicata (with expanded gills), on the back of an Oyster-shell.

Serra. See OVIPOSITOR.

Serra, JUNIPERO, 1713–1784. Franciscan priest, in Mexico from 1749; founder of the missions in California 1769 and later.

Serranidæ. Family of fishes, including *Centropistes* (Black-fish or Sea Bass), *Epinephelus* (Red Grouper), and *Promicrops* (Jew-fish). The grouper is abundant near Florida, and attains a weight of 40 lbs. It is more easily transported in warm climates than most fish, being very tenacious of life. The jew-fish of the same region attains the remarkable weight of over 500 lbs. See ACANTHOPTERI and BASS.

Serrano y Dominguez, FRANCISCO, DUKE DE LA TORRE, 1810–1885. Spanish general, favorite of Queen Isabella, whom he expelled 1868; Captain-gen. of Cuba 1860-62; Duke 1862; Regent 1869; Prime Minister 1871, 1872, and 1874; commander against the Carlists 1872 and 1874.

Serrate. Saw-toothed; in Botany and Zoölogy, margins of leaves, membranes, and other structures having small teeth projecting forward, as in the chestnut.

Serres, OLIVIA. See OLIVE, PRINCESS.

Serrulate. Diminutive of Serrate.

Sertorius, QUINTUS, ab.121–72 B.C. Roman general, who served with distinction against the Teutones, and commanded one of 4 armies which besieged Rome under Marius and Cinna; Prætor 83; sent to Spain 82; outlawed by Sulla. He successfully resisted Metellus and Pompey in Spain until assassinated.

Sertularida. *Calyptoblastica*, in part, the other group included being the *Campanularida*.

Sertularidæ. Family of campanularian *Hydromedusæ*, which has flask-shaped sessile hydrothecæ on opposite sides of

the branched stem. In *Sertularia*, the gonophores do not become detached medusæ as in *Campanularia*.

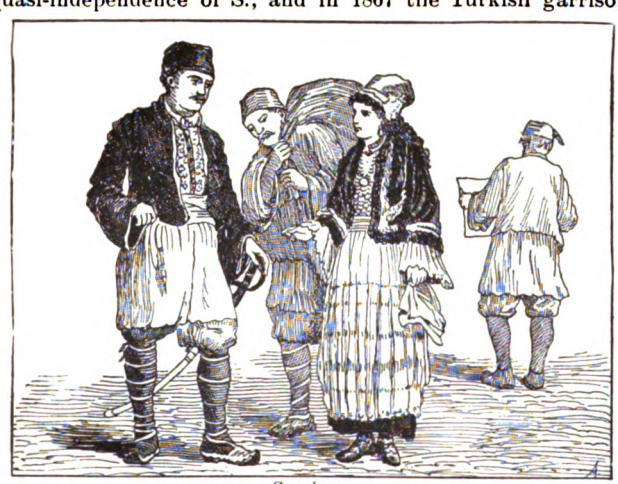
Serum. Light yellow fluid, one of the constituents of blood. It is separated by permitting blood to stand exposed to the air until it coagulates and the clot contracting squeezes out the serum. Its main constituent is ALBUMEN (q.v.).

Serum Therapeutics. Method of treating diseases caused by micro-organisms, as diphtheria and tetanus, by the hypodermic injection of serum derived from the blood of some animal, usually a horse, previously inoculated to generate an antitoxin in his blood. Only a comparatively few of the germ diseases can, as yet, be so treated. See ANTITOXIN.

Servant. See MASTER AND SERVANT.

Servetus, MICHAEL, 1511–1553. Spanish physician and theological inquirer, author of two anti-Trinitarian tracts 1531–32, and of *Christianismi Restitutio*, 1553. For this, at Calvin's instance, he was arrested at Vienne and condemned by the Inquisition. Escaping, he was caught in Geneva, prosecuted by Calvin, and burned by the city authorities. In that persecuting age the German reformers approved the sentence and the deed.

Servia. Kingdom of s. Europe, between Hungary and Turkey. It is mountainous and covered with forests. The chief industry is the raising of cattle, agriculture being in a very primitive condition. The Serbs (Croats) drove out the Avars ab.638, and rid themselves of their Byzantine governors in the 11th century. Their power was broken by the Turks at the battle of Kossova 1389. Austria held most of the territory 1718–39; the Turks were driven out 1804, but regained possession 1813. In 1830 the Porte was compelled to recognize the quasi-independence of S., and in 1867 the Turkish garrisons



Servians.

were withdrawn; in 1876 it declared war on Turkey. Russia intervened to save it from ruin. It became autonomous 1878, with extension of territory on the s. boundary, and in 1882 a kingdom. A war with Bulgaria in Nov. 1885 resulted disastrously. Prince Milan IV. came into power 1868, proclaimed himself king 1882, and abdicated in favor of his son, ALEXANDER I. (b.1876), 1889 (see NATALIE). A liberal constitution was adopted 1889, but that of 1869 was restored 1894 by a coup d'etat. Capital, Belgrade. Area 19,050 sq. m.; pop., 1894, 2,256,084.

Servian. Branch of the Slavonic family of languages, with literature a thousand years old, and rich in modern ballads.

Service. Active service means to be subject at all times to such orders as the military superior may issue, and is in contradistinction to retired service, where only extraordinary conditions may require the status of active service to supervene. When a person in the military service is employed to obtain information clandestinely he is upon secret service: while to act as a spy is not obligatory, any military person may be sent upon a scout or other dangerous service.

Service-Berry. *Amelanchier canadensis.* Shrub or small tree of the Apple family, native of e. N. America: known as Juneberry, and along the coast as Shad-bush.

Service Pipes. Those which convey water from street mains to houses. Lead was used by the Romans, but modern pipes are usually of wrought-iron.

Service-Tree. *Pyrus domestica.* Large, spreading tree of the Apple family, native of Europe; valued for its hard wood.

Servile Wars. Those in which the Roman slaves were led by SPARTACUS (q.v.).

Servites. Augustinian order founded 1233 by Florentine merchants; sanctioned by the pope 1255; devoted to the Virgin. It spread through Europe, and now has houses in England and the U. S.

Servitudes. In Roman Law, more than easements, extending to interests for life in both land and chattels.

Servius, ab.380. Latin commentator upon Virgil.

Servius Tullius. Sixth king of Rome, 578–534 B.C. These dates, and the whole story of his life and tragic end, are largely mythical.

Sesame-Grass. See GAMA-GRASS.

Sesamoid Bones. Small bones developed in the midst of a tendon where there is especial pressure on an adjoining part when the tendon's muscle is contracted. They vary in number in different individuals usually directly as the muscular development. The most pronounced example is the knee-cap, which is always present.

Sesamum. *Sesamum indicum.* Annual herb of the natural family *Pedaliaceæ*, native of India, cultivated for its seeds, from which Benne-seed oil is derived, a constituent of artificial butter.

Sesostris. Egyptian king, probably Rameses II. of the 19th dynasty; alleged conqueror of Ethiopia, Arabia, Thrace, and Scythia; builder of temples, towns, canals, and roads. His dates, exploits, and even his identity, are doubtful.

Sessile. In Botany and Zoölogy, stalkless organs or organisms.

Session. Presbyterian council, consisting of Pastor and Ruling Elders. It has the exclusive competency (saving appeal to Presbytery) of admitting or excluding communicants.

Sestertius. or SESTERCE. Roman coin, at first struck in silver and later in bronze as well, valued originally at 2½ asses, and, when the standard was reduced so that the denarius contained 16 asses instead of 10, at 4 asses.

Sesto, CESARE DA, ab.1470–ab.1524. Italian painter, probably a disciple of Leonardo da Vinci, but later affected by

Youthful Head of Christ, by Cesare da Sesto.

Raphael. The *Vierge aux Balances* of the Louvre, formerly ascribed to Leonardo, is probably his. His *Youthful Head of Christ* is in the Ambrosiana at Milan.

Sestos. Town of Thrace, on the Hellespont opposite Abydos, 7 stadia distant; famous for Xerxes' bridge of boats; also for the loves of Hero and Leander.

Set. In Mining, combination of horizontal and vertical or inclined pieces of timber, so arranged as to support the overlying rock and prevent its falling in. As the work of excavation proceeds, additional sets of similar construction are put in place when needed.

Seta. In Bryology, slender stalk of the sporange in mosses; also more broadly, in Botany and Zoölogy, bristle-like organs.

Setaceous. Bristle-like; in Botany, very slender and pointed leaves.

Setæ. Stiff hairs on worms and other invertebrate animals.

Seth. Third son of Adam, ancestor of Noah and of all mankind since the flood.

Seth, ANDREW, LL.D., b. 1856. Prof. St. Andrews 1887, Edinburgh 1891. *Kant to Hegel*, 1882; *Hegelianism and Personality*, 1887.

Sethites. Division of Ophites, so called because their doctrines were taught in a book bearing the name of Seth.

Setigera. See SUIDÆ.

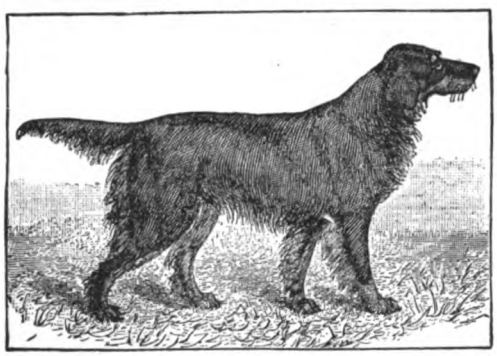
Set-off. Statutory defense which may be interposed to cut down or wipe out a plaintiff's claim.

Seton. Slender skein of silk or cotton thread passed, by means of a needle, into the connective tissue under the skin and permitted to remain with the ends of the skein sticking out on either side. It is so applied to produce irritation to draw the blood to the part and thereby diminish the blood supply in a neighboring diseased part.

Seton, ELIZABETH ANN (BAYLEY), 1774–1821. Founder, 1809–12, at Emmetsburg, Md., of the American order of Sisters of Charity.

Settembrini, LUIGI, 1812–1876. Neapolitan patriot, imprisoned 1839–42 and 1849; Senator 1873. *Letteratura Italiana,* 1869–72.

Setter. Dog used as is the pointer in hunting: of three main varieties, English, black and white, or black, white and tan; Irish, solid mahogany-red; and Gordon or Scottish,



Irish Setter.

black with tan spots on sides of muzzle and lower part of legs. The first was bred from a spaniel and pointer; the latter was a cross of the setter with a collie ab.1800. The origin of the Irish setter is not known.

Settignano, DECIDERIO DA, 1428–1464. Italian sculptor.

Settle, ELKANAH, 1648–1723. English playwright and versifier, satirized by Dryden in *Absalom and Achitophel.*

Settle, THOMAS, 1791–1857. M.C. 1817–21; Judge N. C. Supreme Court 1832–54.—His son. THOMAS, 1831–1888, filled the latter office 1868–71 and 1873–76, and became U. S. District Judge for n. Fla. 1877.

Settlement, LAW OF. English statute of the reign of Charles II., making it legal to return any person without means to the parish where he originally belonged. It was intended to prevent paupers from becoming dependent on parishes not responsible for them.

Seubert, MORITZ, b. 1818. Prof. Polytechnic School, Karlsruhe. *Flora azorica,* 1844; *Die Pflanzenkunde gemeinfasslich dargestelt,* 1849–50; *Lehrbuch der gesammten Pflanzenkunde,* 1853.

Sevagee, 1627–1680. Founder of the Mahratta empire; son of an officer of the last Mohammedan king of Bejapoor. He overturned that kingdom with an army gathered in the mountains, and united the petty States of the Mahrattas under his sway.

Sevastopol. See SEBASTOPOL.

Seven. Sacred number of the Hebrews; commonly deduced from the 7 planets of antiquity, the Sun, Moon, Mercury, Venus, Mars, Jupiter, Saturn. Others declare it the combination of 3, symbolical of God, and 4, of the World.

Seven Bishops. Abp. Sancroft, Bps. Ken, Lloyd, Turner, Lake, White, and Trelowney, who refused to read James II.'s Declaration of Indulgence. They were sent to the Tower June 8, 1687, tried and acquitted June 30. The nation stood by them, and the incident hastened the king's downfall.

Seven Champions of Christendom. St. George (England), St. Andrew (Scotland), St. Patrick (Ireland), St. David (Wales), St. Denys (France), St. James (Spain), St. Anthony (Italy).

Seven Christian Virtues. On the left are the Theological Virtues: Faith, dressed as a nun, holding a church, a New Testament, and a wax taper; Hope, with a beehive and a spade in her hands; Charity, standing upon a hot oven, etc. Then come the Cardinal Virtues; Temperance, with a bridle in her mouth and telescope in her hand; Justice, standing on the seat of justice and balancing swords; Prudence, in the garb of a nun and weighed down under her symbols, a coffin, mirror, sieve and the shield of faith; and Strength, mounted on a screw-press, with an anvil on her head, is holding a donjon in one hand and strangling a dragon with the other.

The Seven Christian Virtues with their Symbols.

Seven Churches. Christian communities of Asia Minor, to which, in the Rev. ii., iii., epistles of mingled praise and warning were addressed. They were Ephesus, Smyrna, Pergamum, Thyatira, Sardis, Philadelphia, and Laodicea. The two specially commended, Smyrna and Philadelphia, still exist.

Seven Cities, ISLAND OF. Imaginary island in the Atlantic, in which a body of Christians, under the guidance of their 7 bishops, were said to have found safety after the Saracen invasion of Spain.

Seven Days' Retreat. Battle in Va., including Mechanicsville, Gaines' Mills, Chickahominy, Peach Orchard, Savage Station, Charles City Cross Roads, and Malvern Hill, June 26 to July 1, 1862. Union loss in killed, 1,582, wounded 7,709, missing 5,958; total Confederate loss 17,583.

Seven Deadly Sins. Pride, covetousness, lust, anger, gluttony, envy, and sloth.

Seven Dolors of the Virgin Mary. R. C. festival, kept on Friday before Holy Week; instituted 1423. Another, dating from 1814, occurs in September.

Seven Gifts of the Holy Ghost. Wisdom, Understanding, Counsel, Ghostly Strength or Fortitude, Knowledge, Godliness, and the fear of the Lord.

Seven Gods of Good Fortune. Group of divinities which form a sort of popular appendage to Japanese Buddhism. They comprise Fuku-roku-jiu, whose pseudonym signifies "Wealth, Prosperity, and Longevity"; Daikoku, represented as standing upon a pair of rice bales; Ebisu, the fisherman; Hotei, a laughing priest; Bishamon Ten, the Brahminic Kuvera; Benten, a goddess identified with Sarasvati; and Ju-ro-jin, genius of longevity.

Seven Last Words. Composition of Haydn for use at Cadiz, originally a series of orchestral pieces designed to follow the reading by the priest of each of the last utterances of Christ; changed to a cantata.

Seven Liberal Arts. In the Middle Ages, Grammar, Dialectic or Logic, Rhetoric (the Trivium), with Arithmetic, Geometry, Music, and Astronomy (the Quadrivium).

Seven Pines. Battle in Va., May 31, 1862. See FAIR OAKS.

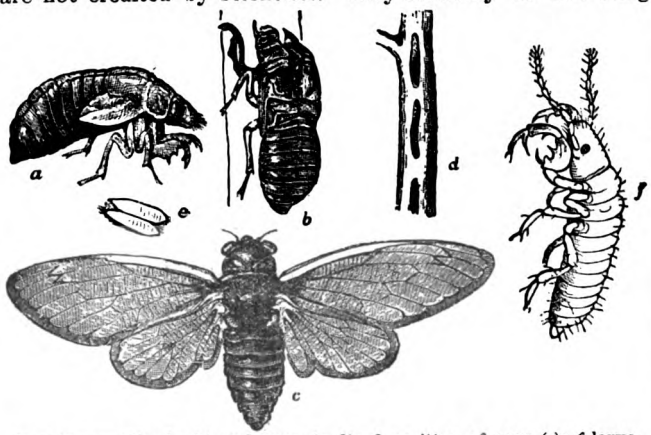
Seven Rivers, LAND OF. Region of the Indus, with the PUNJAB (q.v.). Five streams flow into the Indus from the East; the seventh is the Sarasvati.

Seven Sleepers. Christian youths of Ephesus who, in the Decian persecution, 251, fled into a cave and were walled in. A tradition dating from ab.500 says they slept till 447, when they were brought out and seen by many. They are celebrated in Dr. J. M. Neale's longest poem.

Seven Stars. Sun, Moon, Mercury, Venus, Mars, Jupiter, Saturn; sometimes, the constellation Ursa Major or Charles's Waine; and again, the seven may mean the Pleiades.

Seventeen-Year Locust. This insect is also known as the periodical cicada. The larva of the northern species remains below ground for 17 years, that of the southern species 13. Several distinct broods inhabit different parts of the country, and in places overlap. As each brood comes to the surface to metamorphose in a different year, there are irregular periods of years separating the times of their appearance in certain lo-

calities. Stories about the stinging powers or habits of cicadas are not credited by scientists. They certainly do not sting



The 17-year Cicada (*c*) and pupa (*a*, *b*); *d*, position of eggs (*e*); *f* larva.

with their beaks. The ovipositor is a sort of pointed saw, by means of which a double row of punctures is made in twigs to receive the eggs. See HOMOPTERA.

Seventh-Day Adventists. See ADVENTISTS.

Seventh-Day Baptists. Denomination founded in England 1650, in America 1665–71; called Sabbatarians till 1818. U. S. had, 1895, ab. 90 congregations, 8,531 members, a college and publishing house at Alfred Center, N. Y., and colleges at Milton, Wis., and Salem, W. Va.—A German sect of this name was founded 1728 at Ephrata, Pa., by C. BEISSEL (q.v.). A small remnant still exists.

Seven Up. See ALL FOURS.

Seventh Son. In popular superstition, probably derived from the East, thought to possess peculiar powers of divining the future and revealing past events. Still greater powers are attributed to the seventh son of a seventh son, and so on. The survival of the notion is constantly illustrated by advertisements of astrologers and other charlatans.

Seven Wise Masters. Oriental tales of 10th century or earlier, existing in various forms in Arabic, Hebrew, Persian, and many languages of Europe. The chief is that of Sindbad.

Seven Wise Men. Traditional sages of ancient Greece; Thales of Miletus, Solon of Athens, Chilon of Sparta, Pittacus of Mitylene, Bias of Priene, Cleobulus of Lindus, and Periander of Corinth. Their chief maxims respectively were: Suretyship is the precursor of ruin; Know thyself; Consider the end; Know thy opportunity; Most men are bad; Avoid excess; Nothing is impossible to industry.

Seven Wonders of the World. In Antiquity, Pyramids of Egypt, Hanging Gardens of Babylon, Mausoleum at Halicarnassus, Temple of Diana at Ephesus, Colossus of Rhodes, Statue of Zeus by Phidias, and Pharos of Alexandria. These are variously given. In the Middle Ages, the Colosseum of Rome, Catacombs of Alexandria, Great Wall of China, Stonehenge, Leaning Tower of Pisa, Porcelain Tower of Nankin, and Mosque of St. Sophia at Constantinople.

Seven Years' War. 1756–63; third and final contest for Silesia, between Maria Theresa of Austria, in alliance with Russia, Poland, Saxony, France, and, from 1757, Sweden, and Frederick the Great, assisted by England. The first campaign, Frederick having anticipated his enemies and marched on Dresden, ended with the surrender of the Saxons. The campaigns of 1757 and 1758 ended with a slight advantage to the Prussians. See battles of PRAGUE, KOLIN, ROSSBACH, LEUTHEN, GROSSJAGERNDORF, ZORNDORF, HOCHKIRCH. In the campaign of 1759 Frederick suffered many reverses and the severe defeat of Kunersdorf: the treasury was exhausted. See battles of BERGEN, MINDEN, and KUNERSDORF. In 1760 Frederick, with an army reduced, gained the victory of Liegnitz, and drove the Russians and Bohemians across the frontier; but Oct. 3 the Russians and Austrians took and plundered Berlin; the Swedes came down from the North, and Loudon from the South; Frederick turned upon and routed Daun, and drove out the rest; the French were defeated at Einsdorf and Marbourg. The campaign of 1761 opened well for Frederick on the Rhine; but the Russians and Austrians effected a junction in Silesia. Reverses in Pomerania and Silesia and the failure of subsidies from Britain made Frederick's prospects almost hopeless, when the death of the Czarina converted Russia into an ally, and Sweden retired from the contest. The campaign of 1762 was a series of successes for Frederick; France gave up the contest, and Maria Theresa reluctantly signed the peace of Hubertsberg, Feb. 15, 1763. Frederick was now Lord of Silesia. The prestige of the Prussian army was not lost till 1806.

Severinus. Pope May 28–Aug. 1, 640. He condemned the Monothelites.

Severinus, ST., d.482. Patron of Austria and Bavaria; missionary in Pannonia and Noricum.

Severn. 1. River of England, rising in Wales and flowing e., s., and s.w. into Bristol Channel. Length 210 m.; mainly navigable. 2. River rising in n. Manitoba, and flowing n. and n.e. to Hudson's Bay. Length ab. 350 m.

Severn, JOSEPH, 1796–1879. English artist, friend of John Keats; Consul at Rome 1861–72.

Severus, FLAVIUS VALERIUS, d.307. Cæsar 306.

Severus, MARCUS AURELIUS ALEXANDER. See ALEXANDER SEVERUS.

Severus, LUCIUS SEPTIMIUS, 146–211. Emperor 193; commander of an army in Pannonia when proclaimed. He defeated his rivals, Pescennius Niger, at Issus 194, and Albinus at Lyons 197; fought the Parthians 197–198; reformed the prætorians, deprived the Senate of power, and went to Britain 208, where he built the famous wall (see WALL OF HADRIAN) and died at York.

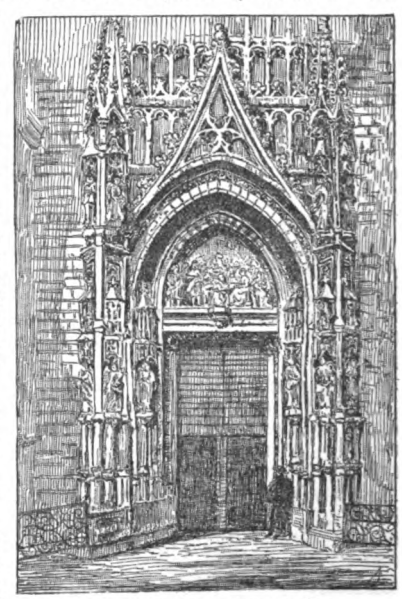
Laurel-crowned bust of Severus.

Sevier, JOHN, 1745–1815. Pioneer and Indian fighter, eminent for military and civil services during the Revolution and later; chief founder and organizer, with James Robertson, of Tenn.; Gov. of the State of Franklin 1785, and of Tenn. 1796–1801 and 1803–9; Brig.-gen. 1786; M.C. 1811–15. His is the greatest name in the early history of that region.—His nephew, AMBROSE HUNDLEY, 1801–1848, was M.C. from Ark. 1827–36, and U. S. Senator from 1836.

Sevier Lake. In w. Utah; salt; fed by S. River, and without outlet. Area ab. 200 sq. m.

Sévigné, MARIE (DE RABUTIN-CHANTAL), MARQUISE, 1626–1696. French writer, famous for her *Letters* to her daughter, pub. 1726 and later.

Seville. Ancient city of s. Spain, on the Guadalquivir; important since Roman times; held by Moors 712–1248. It has a celebrated cathedral and some manufactures. Pop. ab. 150,000.

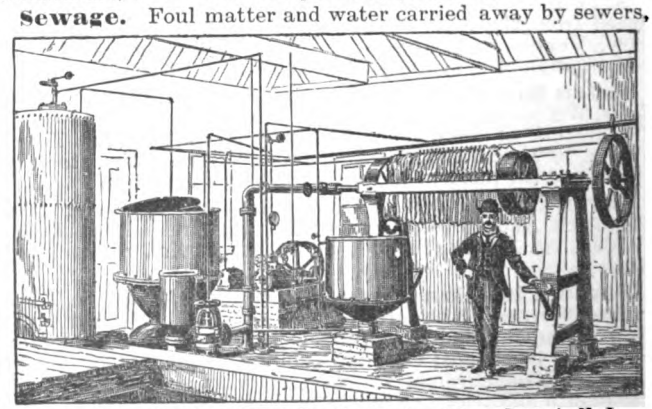


Door of Cathedral at Seville.

Seville, TREATY OF. Signed Nov. 9, 1729, between Spain, France, Holland and England, in opposition to PRAGMATIC SANCTION (q.v.). It guaranteed the succession of Don Carlos to the Italian duchies.

Sevres. Town of France, 10 m. s.w. of Paris, famous since 1756 for its porcelains. Seat of the national artistic porcelain works, founded 1745 at Vincennes and transferred here 11 years later, to which is attached a museum of ceramic art, the first in Europe. Pop., 1891, 6,902.

Sewage. Foul matter and water carried away by sewers,



View of interior of sewage purification works at Long Branch, N. J.

including the discharge of water-closets and kitchens, but not solid refuse like garbage. The amount is usually taken the

same as that of the water supplied to the town. Sewage may be regarded as water holding many foul materials both in suspension and in solution. It is carried away from the town or city by sewer pipes and usually emptied into a stream or harbor. Sometimes it is collected in tanks, where it is chemically precipitated, the precipitated sludge being used as a fertilizer, while the liquid effluent is so pure that it may be allowed to run into a stream without danger of pollution. The foul gases arising in sewers from the decomposition of sewage are a source of danger if allowed to enter the houses, but are comparatively harmless if allowed to escape into the streets, where thorough dilution with air occurs. See SEWERAGE and SEWER.

Sewall, SAMUEL, 1662–1730. Judge at Boston 1692–1718; Chief-justice of Mass. 1718–28; noted for his *Diary*, 1673–1729, pub. 1878.—His grandnephew, JONATHAN, 1728–1796, Loyalist, was Atty.-gen. of Mass. 1767, and Judge of Admiralty in New Brunswick from 1788.—A cousin, STEPHEN, 1734–1804, prof. Harvard 1764–85, pub. a Hebrew Grammar 1763.

Seward, ANNA, 1747–1809. English poet. *Letters*, 6 vols., 1811–13.

Seward, WILLIAM HENRY, LL.D., 1801–1872. Gov. of N. Y. 1837–43; U. S. Senator 1849; anti-slavery and Republican leader; prominent candidate for presidential nomination 1860; Sec. of State 1861–69; wounded by an assassin April 14, 1865; a statesman of earnest convictions and moderate temper. *Works*, 5 vols., 1853–84.—His cousin, THEODORE FRELINGHAUSEN, b.1835, musician, writer, and compiler, introduced the Tonic sol fa system 1877.—A cousin, GEORGE FREDERICK, b.1840, was U. S. Consul at Shanghai 1861–76, and Minister to China 1876–80.

Sewell, ELIZABETH MISSING, 1815–1884. English writer of novels, histories, and devotional books. *Amy Herbert*, 1844.

Sewell, JONATHAN, LL.D., 1766–1839. Chief-justice of Lower Canada 1808–38.

Sewell, WILLIAM, 1650–ab.1725. Historian of the Quakers 1717–22; resident in Holland.

Sewer. Large pipe or brick tunnel constructed to carry sewage away from a town. The first sewers built were by the Romans; some of these are still in service. Sewers were not built in London until ab.1670; these were drains for removing surplus surface water. Till 1815 it was forbidden by law to discharge sewage into them, this being required to be conveyed into cesspools; after 1815 it was permitted to drain the houses into sewers, and in 1847 it was made compulsory. Sewers of small size are made circular in section, those of large size are of circular, oval or ∩ shape in cross-section, as may be required by the nature of the soil and foundation. The velocity of flow in a sewer is usually limited to 5 or 6 ft. per second, and it should be more than 2 ft. per second to prevent deposit. Sewers are frequently designed to carry the storm water of the streets as well as the house sewage; this is the combined system. See CLOACA MAXIMA.

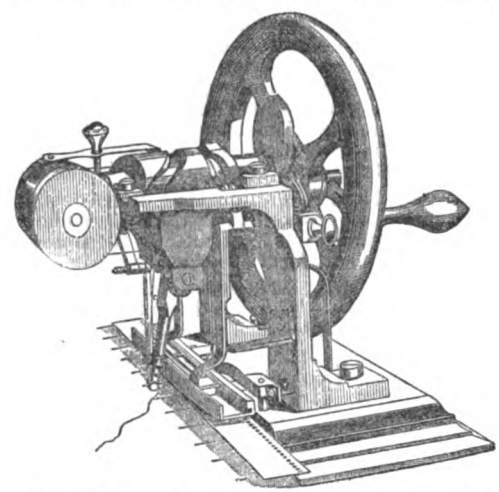
Sewerage. Plant whereby sewage is conveyed out of a town, consisting of the main and lateral sewers, with their manholes, basins, tanks, and other appurtenances. All systems may be classed under two principles; removal by water under gravity, and removal by the use of air compression or exhaustion. Water carriage systems are of two kinds, the combined and the separate.

In the combined system the sewers carry not only the house sewage, but also the storm water of the streets. Basins are provided at the street corners to receive the storm water and collect the sand or gravel. Manholes are built at frequent intervals on the sewer line to allow deposits to be removed. The sewers are only partially filled with sewage under ordinary conditions, while during a storm they are fully filled and thorougly flushed. In a seacoast city collecting tanks are sometimes built where the sewage accumulates at high tide; these are provided with automatic gates, which open as the tide goes out. Large cities usually have the combined system.

In the separate system the sewers carry only the house sewage, while the rain water is conveyed away on the surface of the streets or by another system of drains. The sewer pipes are hence much smaller than in the combined system, and in order to flush them water is discharged into them at intervals from automatic tanks. This system is adapted to small cities and towns, particularly where the surface is hilly, so that the storm water can be led away without underground drains. Manholes are built on the main sewer lines, and lamp holes are sometimes put intermediate to them, so that obstructions can be detected and removed.

The pneumatic systems of sewerage are of two kinds, vacuum and plenum methods. The Liernur and Berlier systems, used in Holland and in France to a limited extent, collect the sewage in street basins; these are connected with pipes from which the air is exhausted by pumps at a central station. At stated intervals the matter in the basins is drawn by the suction into the pipes and carried to a central station, whence it is conveyed away by gravity or by pumping. The Shone system, used in England and in a few American cities, collects the sewage in basins, from which it is forced to a central station by compressed air. The Shone system was used at the World's Columbian Exposition of 1893 in Chicago with very satisfactory results; its cost, however, is greater than that of the combined or separate system. From Berlin the sewage is conducted to sewage-farms and the resulting crops partially repay the expense. This plan is also used to some extent in Paris.

Sewing-Machine. Invented by Elias Howe 1845. A machine for sewing was first patented in England 1755. Sewing machines have sometimes been classified into two groups, the single thread and the double thread: sometimes into four classes, those which send the needle completely through the cloth as in hand sewing those which hook the thread into a



Elias Howe's Original Sewing Machine. Invented 1845, patented 1846.

chain-stitch by a sort of crochet needle, those which form a loop by a second thread carried across the first by a shuttle, and those making the lock stitch, the same on both sides. The last is the best. Sewing machines have arrived at that state of perfection that they can do almost every kind of work that can be done with the needle.

Sex. Philosophers have believed that in the universe are two distinct principles, male and female, the co-operation of which was essential to creation of new forms. It was said, "the soul comes from the father, the body from the mother, in the creation of an individual." But modern biology has shown that, taking the living world as a whole, most reproduction takes place non-sexually; and also that when in sexual reproduction the egg is fecundated by a sperm, the essential phenomenon is the union of idioplasm derived from the father with a similar amount of idioplasm derived from the mother. This idioplasm is itself not sexed, but simply capable of assimilation and production of protoplasm of certain characteristics, including those of both sexes, on both the father's and the mother's side. Sexual differentiation is determined by external conditions, and is a special dimorphic case of polymorphic differentiation. Thus among bees, different treatments cause the eggs to develop into females, neuters, or drones, as the case may be. The object of sex is to produce offspring containing protoplasm united from two different sources or strains, in order to cause variation, and thus progress. To effect this the two sexes are more or less differentiated to perform special parts in the work.

Sexagenary. By sixties; applied to the division of the circle into six equal parts (sextants), of which the subdivisions have a scale of sixty.

Sexagesima. 2d Sunday before Lent.

Sexagesimal Arithmetic. See LOGISTIC.

Sexivalent. Elements having a valence of VI.

Sextans. Constellation lying across the celestial equator s. of Leo. Mean right ascension 10h., declination 0.

Sextant. See QUADRANT.

Sextic. Quantic of 6th degree.

Sexton. Subordinate officer of the church, whose duty it is to take care of the sacred vessels and vestments, to keep the church clean, etc. Also called a sacristan.

Sextus Empiricus, ab.200. Empirical physician and skeptical or anti-dogmatic philosopher at Alexandria and Athens. His *Hypotyposes* and *Adversus Mathematicos* were pub. 1842.

Sexual Dimorphism. See DIMORPHISM.

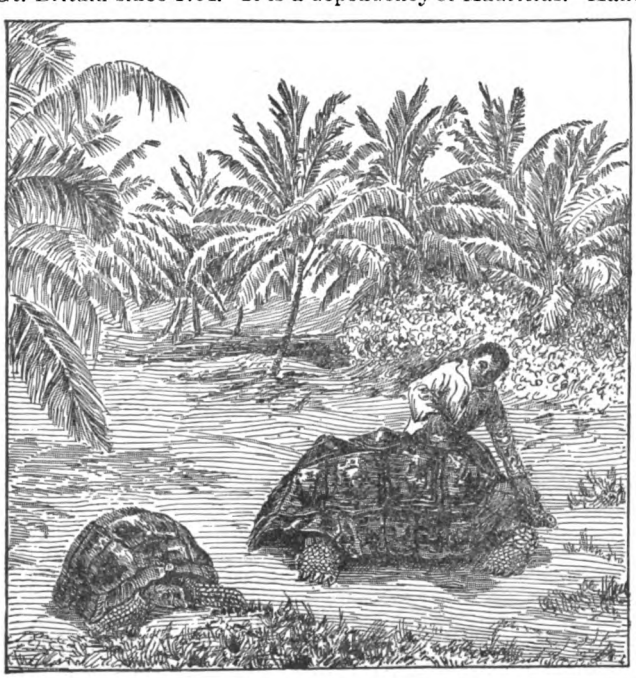
Sexual Generation. Stage of certain plants in which the sexual organs are borne and fecundation accomplished, there being in these plants another state or Asexual Generation where they are absent. The term is of especial application in the *Bryophyta* and *Pteridophyta.*

Sexual Reproduction. Production of offspring from fertilized eggs. The eggs are cells more or less loaded with food yolk, for the early nourishing of the embryo; the fertilizing element is the sperm, a cell consisting of a head of nearly pure chromatin or idioplasm, and a propelling flagellum or tail. Fecundation consists in the union of the chromatin of the egg nucleus with that brought by the sperm, to form a new nucleus, whose subsequent divisions produce all the cells of the developing body. Much speculation has been given to explain the reason for this union, as many organisms hold their own by the much more efficient asexual reproduction. It has been supposed to confer variability, and thus give a chance for natural selection to secure adaptability to a changing environment. It has also been supposed to be a rejuvenescence. Males and females are organisms specialized to produce each sort of cell, but in many cases both ova and sperms are produced by each organism, though self-fertilization rarely takes place. This in fact would defeat the object of sex. See POLAR GLOBULES, GEMMULES, HEREDITY, and VARIATION.

Sexual Selection. Selection that arises during mating-time among animals, by which the strongest and best adapted males secure the females and so transmit these characters to the young; most efficient form of natural selection.

Seybert, ADAM, M.D., 1773–1825. M.C. from Pa. 1809–15 and 1817–19; naturalist. *Statistical Annals of U.S.*, 1818.—His son, HENRY, 1802–1883, was a mineralogist.

Seychelles. Group of 30 islets in the Indian Ocean, 600 m. n.e. of Madagascar; colonized from France 1742; held by Gt. Britain since 1794. It is a dependency of Mauritius. Mahé



Seychelles Islands—Native turning Turtle.

is the largest, having an area of ab. 59 sq. m. The chief products are tropical fruits. Rain is frequent, and the regularity of the winds makes the islands healthful. Area ab. 100 sq. m.; pop., 1891, 16,440.

Seyffarth, GUSTAVUS, D.D., 1796–1885. Prof. Leipzig 1825–55, and Concordia Theol. Sem., St. Louis, 1855–71; archæologist.

Seymour, HORATIO, LL.D., 1810–1886. Gov. of N. Y. 1853–55 and 1863–64; active in support of government; Democratic candidate for Pres. 1868.

Seymour, JANE, ab.1510–1537. Maid of honor to Anne Boleyn, and her successor 1536 as (3d) queen of Henry VIII.

Seymour, ORIGEN STORRS, LL.D., 1804–1881. M.C. 1851–55; Judge Conn. Superior Court 1855–63, and Supreme Court 1870; Chief-justice 1873–74.—His uncle, HORATIO, LL.D., 1778–1857, was U. S. Senator from Vt. 1821–33.

Seymour, THOMAS DAY, b.1848. Prof. Yale 1880; ed. *Iliad*, 1887–91.

Seymour, THOMAS HART, 1808–1868. Gov. of Conn. 1850–53; U. S. Minister to Russia 1853–57.

Seymour, TRUMAN, U.S.A., 1824–1891. Brig.-gen. U. S. Vols. 1862, serving chiefly in Va., Md., and S. C.

Sfax. Seaport of Tunis, 74 m. s. of Susa. It is famous for its olive gardens. Sponges, woolen stuffs, camels and olive oil are its chief articles of commerce. It is supposed to be the Taphroura of Ptolemy, and is principally inhabited by Jews. Pop. 42,500.

Sforza, FRANCESCO, 1401–1466. Italian leader of condottieri, whose father was ennobled ab.1420; Duke of Milan (by usurpation) from 1450.—His grandson, LODOVICO, 1451–1510, became Duke by murder and usurpation 1494, was attacked by the French, and imprisoned from 1500.—Of his sons, MASSIMILIANO, 1491–1530, was twice expelled; FRANCESCO II., 1492–1535, Duke from 1522, was the last of his line: after him Austria seized Milan.

Sgambati, GIOVANNI, b.1843 at Rome. Pianist and composer, of German tastes; pupil of Liszt. His principal works are two quintets for pianoforte and strings, a concerto for pianoforte in G minor, and a symphony in D.

Sgraffito, or SCRATCHED WORK. Italian method of decorating a plain surface. Colored plaster is laid on and this covered with a white one, after which the design is scratched through with an iron bodkin. The colored work shows through and makes the contrast.

Shabbatai Tsevi, 1626–1676. Jewish impostor, proclaimed as Messiah in Asia Minor 1665.

Shad. See ISOSPONDYLI and CLUPEIDÆ.

Shad-Bush. See SERVICE-BERRY.

Shaddock. *Citrus decumana.* Tree of the Orange family, native of China, cultivated in tropical regions for its pulpy, edible fruit, which sometimes attains the diameter of 18 in.

Shadow. Portion of space from which illumination from a source of light is cut off by an opaque body. See UMBRA.

Shadow Pictures. Made with the hands on the wall, or by means of designs cut from paper and placed behind a screen. Both methods are common in e. Asia. In Corea, children make shadow pictures with their hands, invariably to represent a Buddhist priest. In Japan, a bird-catcher is the usual figure. Japanese children also have a great variety of paper shadow pictures. In Siam and Java large images with movable limbs are employed in regular shadow dramas. A common name for such performances is Chinese Shadows.

Shadwell, THOMAS, 1640–1692. English dramatist; poet laureate 1688; satirized by Dryden in *MacFlecknoe.*

Shaffner, TALIAFERRO PRESTON, 1818–1881. American writer on telegraphy and inventor of methods of blasting.

Shafiites. One of the four principal sects of the Sunnites, the orthodox Moslems.

Shaft. Opening, vertical or nearly so, through which communication is maintained between the surface and the interior of a mine, and in which the operations of hoisting, pumping, etc., are carried on. Shafts vary in shape and in dimensions according to the extent of the mine and the purposes for which they are to be used, some being circular, some rectangular, and some having other polygonal shapes. A common diameter for a circular shaft is from 12 to 15 ft.

Sinking a Shaft.

Shaft. The portion of a column between the base and capital, often polished, if of different material, and octagonal, as in late Norman work. In Early English they are of round, separate stones. In the Decorated style they are very small and not separate. In the Perpendicular style they are round, filleted, and not separate.

Shaft and Shafting. Cylindrical rods for the transmission of the effort of the motor to the working point by means of their resistance to torsion. Older shafts were

also square or polygonal: modern shafts are always round. Largest shafts are those for marine practice either from engine crank to propeller wheel or to side paddle-wheel. Propeller shafts are forged with flanges on each end of the lengths to couple them together by means of bolts. The length nearest the wheel has the rings made upon it for the thrust bearing, and ends in the taper fit for the wheel. Some of the newest modern ones are hollow, to avoid the defective center likely to occur in large forgings. They are made of iron or of steel. Crank-shafts for engines are either forged solid or are built up by shrinking and keying the crank-arms upon the pins and shaft. Smaller shafting for transmission of power in shops is made either of turned or cold-rolled bars (see COLD-ROLLED) of solid iron or steel, and recently of hollow tubes for lightness with equal torsional stiffness. Such shafting is supported upon hangers, and carries the pulleys (see HANGERS and PULLEY) necessary for the tools in use. Such shafting, being exposed both to twisting and bending from the weight of pulleys and strain of belts, will need to be stronger than if under torsion only. A solid shaft 22 in. in diameter is a very large one.

Shaftesbury, ANTHONY ASHLEY COOPER, 1ST EARL, 1621–1683. M.P. 1640 and 1653; Baron and Chancellor of the Exchequer 1661; Earl 1672; Lord Chancellor 1672–73; thenceforth active in opposition; imprisoned 1677–78 and 1681; in exile 1682; brilliant and energetic, but selfish and changeable; satirized by Dryden as Achitophel.—His grandson and namesake, 3D EARL, 1671–1713. M.P. 1695–98, Earl 1699; philosophic writer of the freethinking or "Deist" school, advocating the doctrine of a moral sense. His works were mostly collected in *Characteristics*, 3 vols., 1711–14.—7TH EARL, D.C.L., 1801–1885. M.P. 1826, Earl 1851; chairman of the Lunacy Commission from 1828; active in philanthropy; prominent in the extreme Evangelical school.

Shagreen. Leather made from skins of sharks and other fish, and used for covering boxes, etc. In Asia it is employed for shoes, binding of MSS., and other purposes.

Shah. Sovereign of Persia. See NASR-ED-DIN.

Shahjahanpur. City of n. India, on a branch of the Ganges; founded 1647. Pop., 1891, 78,522.

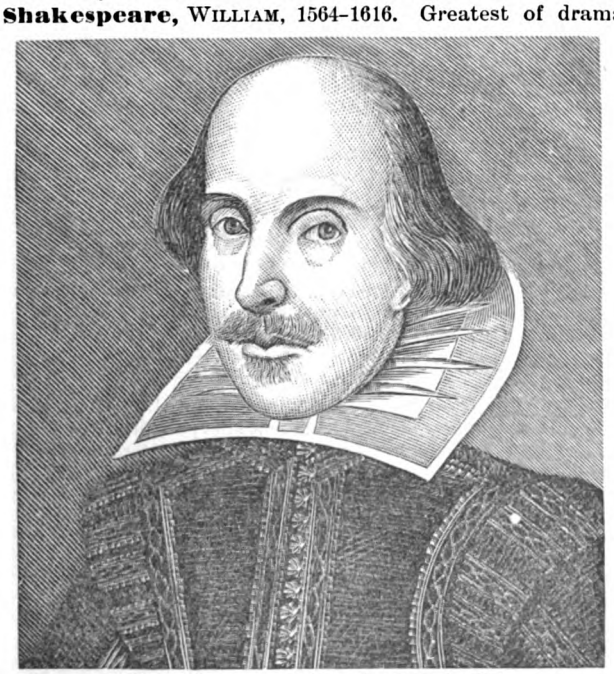
Shah Jehan, d.1666. Mogul emperor of Delhi 1627; conqueror of neighboring kingdoms; able ruler, who had a splendid court, and built many notable edifices.

Shah-Nameh. Persian national epic. See FIRDAUSI.

Shairp, JOHN CAMPBELL, 1819–1885. Scottish essayist, critic, and poet; prof. St. Andrews 1861, principal 1868; prof. Oxford from 1877. *Culture and Religion*, 1870; *Poetic Interpretation of Nature*, 1877; *Aspects of Poetry*, 1881; *Burns*, 1884.

Shakers. Community of English origin, rejecting marriage, private property, war, and oaths; organized in America by Ann Lee 1776; nicknamed from the "dancing" at their services. Their chief seats are at New Lebanon and Watervliet, N. Y. They have fifteen societies and ab. 1,728 members.

Shakespeare, WILLIAM, 1564–1616. Greatest of dramatists, and most consummate master of expression of all English writers; born at Stratford-on-Avon; married to Anne Hathaway 1582; in London as actor and manager from ab.1586 till ab.1611, when he retired to New Place in his native town. The records of his life are scanty, and in part (as the tale of deer-stealing) legendary and dubious. His magnificent *Sonnets*, pub. 1609, dedicated and mainly addressed to "Mr. W. H." (probably Wm. Herbert, later Earl of Pembroke), are intensely individual, and show that, while his conduct was not always exemplary, his soul was worthy of his genius. His early poems, *Venus and Adonis* and *Lucrece*, are less important. These are supposed to date from 1590–94; most of the sonnets are not much later. The plays, classified as tragedies, comedies, and histories, were not collected till 1623; 20 (out of 37 usually credited to him) were printed in his lifetime. Their respective dates are matters of controversy. Prof. Dowden places them under four periods, thus: — I., 1590–95. *Titus Andronicus* (if his at all), *1 Henry VI.*, *Love's Labor's Lost*, *Comedy of Errors*, *Two Gentlemen of Verona*, *Midsummer Night's Dream*, *2* and *3 Henry VI.*, *Richard III.*, *Romeo and Juliet*, *Richard II.*, *King John*, *Merchant of Venice*.—II., 1595–1601. *1* and *2 Henry IV.*, *Henry V.*, *Taming of the Shrew*, *Merry Wives of Windsor*, *Much Ado About Nothing*, *As You Like It*, *Twelfth Night*, *All's Well that Ends Well*, *Measure for Measure*, *Troilus and Cressida*.—III., 1601–8. *Julius Cæsar*, *Hamlet*, *Othello*, *Lear*, *Macbeth*, *Antony and Cleopatra*, *Coriolanus*, *Timon*.—IV., 1608–11. *Pericles*, *Cymbeline*, *Tempest*, *Winter's Tale*. *Henry VIII.* is Shakespeare's only in part. Other plays are doubtfully ascribed to him.


William Shakespeare (from the second folio).

Shaking Table. Form of ore-dressing apparatus in which the pulp flows slowly over a plane surface, to which a shaking motion is imparted to facilitate the sorting of the material.

Shale. Clay more or less hardened, easily splitting into somewhat even flakes of stratification.

Shale, ALUM. Formed of coal, clay, and iron pyrites; occurring in nature in large quantities. Treated with sulphuric acid, it yields alum.

Shaler, ALEXANDER, b.1827. Brig.-gen. U. S. Vols. 1863–65; engineer.

Shaler, NATHANIEL SOUTHGATE, b.1841. Assistant in Museum of Comparative Zoölogy, Cambridge, 1865; Prof. of Paleontology at Harvard 1868; director of Ky. Geological Survey 1873–80; geologist to U. S. survey, Atlantic division, from 1884; Prof. of Geology at Harvard 1887; author of geological reports and popular scientific works.

Shallon. *Gaultheria shallon.* Evergreen shrub of the natural family *Ericaceæ*, native of n.w. N. America. Its fruit is used as food by Indians.

Shalloon. Worsted cloth made at Chalons-sur-Marne, France.

Shallot. *Allium asalonicum.* Biennial, bulbous herb of the Onion family, native of Palestine; cultivated and used as food by eastern nations.

Shalmaneser. King of Assyria 727–722 B.C.; conqueror of Israel; deposed and succeeded by Sargon.

Shamanism. Primitive type of religion still generally existing among Ural-Altaic peoples; also, with the Eskimo and many aboriginal American tribes. The Shaman, or wizard priest, is believed to have the power of controlling the spirits and various powers to which all the occurrences of life are supposed to be due. By the aid of magic he exorcises demons, procures oracles, and harmonizes the relations of the spiritual with the living world. His practices frequently rest upon an elaborate cosmogony.

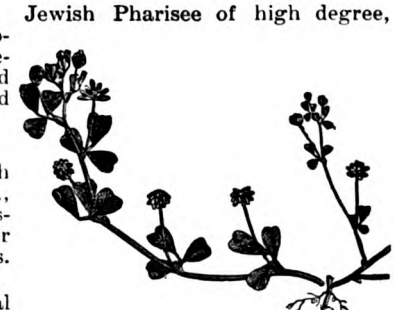
Shame. Disagreeable feeling accompanying the consciousness of action contrary to the standard of conduct or morality held by the agent. The ordinary feeling which accompanies a violation of decency is a product of social life and cannot be considered as innate.

Shammai, 1st cent. Jewish Pharisee of high degree, whose severity was opposed to Hillel's gentleness. The schools founded by these two doctors lasted 200 yrs. or more.

Shamo. See GOBI.

Shamokin. Borough of Northumberland co., Pa., 19 m. e. of the Susquehanna; important for its anthracite coal mines. Pop., 1890, 14,403.

Shamrock. National emblem of Ireland; plant with trifoliolate leaves, a clover, of which several varieties are used. Tradition declares that it was employed by


Lesser Yellow Trefoil (*Trifolium minus*).

St. Patrick to illustrate the doctrine of the Trinity. The Lesser Yellow Trefoil is the plant usually sold in Dublin on St. Patrick's Day.

Shamyl. See SCHAMYL.

Shanghai. City of China, the most important of its seaports; on the Wu-sung River, 12 m. above its mouth. It was first opened to foreign trade 1843. It has a foreign quarter, comprising British, French, and American "Concessions," stretching ab. 2 m. along the Wu-sung. The tonnage of ships sailing hence was, in 1893, 3,264,985 tons. Pop. ab. 400,000.

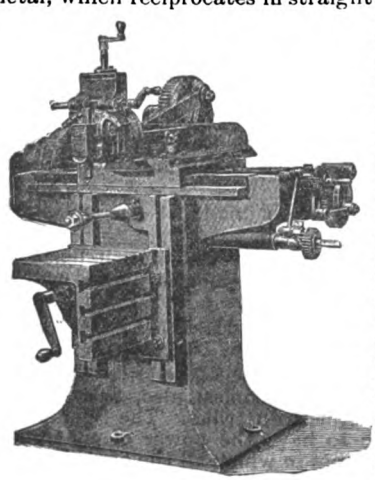
Tower of Long-Hua, Shanghai.

Shannon. Chief river of Ireland, rising in the Cuilcagh Mts. and flowing s. and s.w. to the Atlantic. Length 254 m., including lakes and canals; partly navigable.

Shannon, WILSON, 1802–1877. Gov. of Ohio 1838–40 and 1842–44; U. S. Minister to Mexico 1844; M.C. 1853–55; Gov. of Kansas 1855–56.

Shans. Siamese race, of Chinese origin, living in Indo-China since ab. 100 B.C. Their various tribes are scattered, but chiefly on the borders of Burmah, Siam, Tongkin, and China.

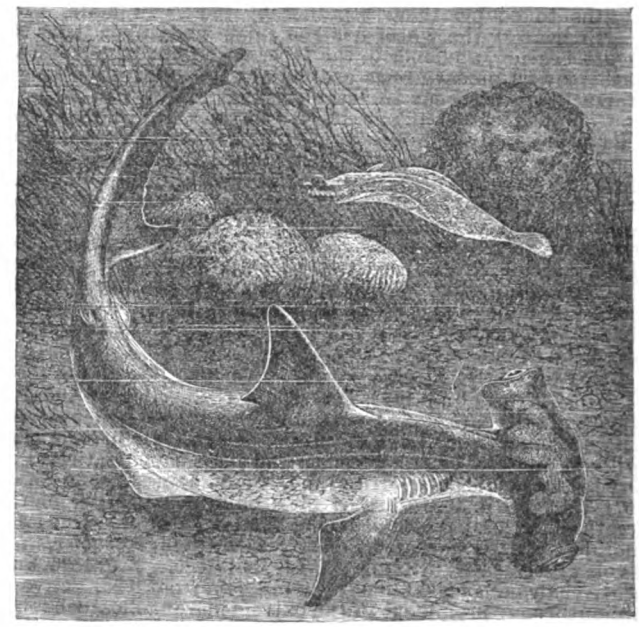
Shaper. 1. Friezing machine for wood. 2. Properly, tool for metal, which reciprocates in straight lines over the stationary work which receives the feed motions. The casting which carries and guides the reciprocating tool sometimes can be fed laterally on shears or a bed (traveling-head shaper) to finish extended surfaces whose straight line elements are short. The tool is usually driven with a Whitworth quick-return crank motion. Such tools are specially adapted for surfaces of incomplete revolution (as crank-hubs and rod-ends), and for small pieces where the traverse of the entire planer bed would entail a waste of power, and the necessity for accuracy and planeness of surface is not great. It is a combined lathe and planer.



Shaper.

Shapur, or SAPOR. I. Son of Ardashir, founder of the Sasanian empire of Persia. He reigned 242–272, and captured the Emperor Valerian 260, but seems not to have permanently extended his boundaries.—S. II., King 310–379. He maintained a war with the e. Roman Empire 337–363; Constantius was repeatedly defeated, Julian mortally wounded while on the retreat from Ctesiphon, and Jovian consented to a shameful peace. Later S. attempted the conquest of Armenia.—His son, S. III., King 384–389, at once made peace with the Romans, but was slain by his nobles.

Sharks (SQUALIDES). Spindle-shaped Plagiostomes, with lateral gill-slits, eyelids with free edges, incomplete shoulder girdle, and no cranial fin-cartilages. The pectoral fins are borne more or less vertically. The teeth are in numerous rows and are dagger-shaped. The group falls into two subgroups, *Cestraphori*, including *Cestracion*, the Port Jackson Shark of Australia, the only living representative of a fossil group furnished with crushing teeth, and the *Squali* proper, which are subdivided into *Cyclospondyli* (Dog-fishes, Greenland Shark), *Asterospondyli* (Tropical sharks, Hammerhead), *Dispondyli* (*Notidanus*), and *Tectospondyli* (*Squatinidæ*). The genera *Carcharias* and *Carcharinus* include the Maneaters. The former contains a single species, *C. rondetetii*, which attains or exceeds a length of 40 ft. (The Basking Shark, *Cetorhinus maximus*, sometimes attains a length of 30 ft., but it rarely attacks man.) The second genus includes many species,



Hammerhead Shark (*Zygaena malleus*).

of which the Great Blue Shark and the White Shark are the most formidable, approaching at times a length of 35 ft. They are very voracious and follow ships, swallowing anything thrown overboard.

Sharon. Fertile plain near the coast of Samaria and n. Judæa.

Sharon, WILLIAM, 1821–1885. Senator from Nev. 1875–81; banker and mine owner.

Sharon Springs. Summer resort in Schoharie co., N.Y., with sulphur springs, 59 m. w. of Albany.

Sharp, ABRAHAM, 1651–1742. English mechanician and mathematician, connected with the Greenwich Observatory 1676–90. *Geometry*, 1717.

Sharp, GRANVILLE, 1734–1813. English philanthropist, prominent in opposition to slavery.—His grandfather, JOHN, D.D., 1644–1714, was Dean of Norwich 1681–86 and Abp. of York from 1691.

Sharp, JAMES, 1618–1679. Abp. of St. Andrews 1661; detested as an apostate from the Scottish cause and tool of tyranny; murdered by Covenanters.

Sharp, WILLIAM, 1749–1824. English engraver, remarkable for the cleanness and purity of his line. He engraved many plates after Guido, West, and Reynolds.

Sharpe, CHARLES KIRKPATRICK, 1781–1851. Scottish collector, compiler, and lyric poet. *Etchings*, 1869; *Correspondence*, 1888.

Sharpe, DANIEL, 1806–1856. English geologist and paleontologist, author of two important papers upon cleavage and the contortion of shells and trilobites under pressure.

Sharpe, SAMUEL, 1799–1881. English Orientalist; voluminous writer on Egyptian and biblical topics. *Hist. Hebrew Nation and Literature*, 1869.

Sharpless, JAMES, ab. 1750–1811. Anglo-American portrait-painter.

Sharpshooter. Expert rifleman in the U. S. service. With the present .30 caliber rifle a sharpshooter must attain an aggregate of at least 480 points in firing at ranges 200, 300, 500, 600, 800, and 1,000 yds., and at skirmish firing of 20 shots for each run down and back starting from 600 yds. and going to 200 yds., and then back. The target for 200 and 300 yd. range is 6 ft. by 4, bull's-eye 10 in. by 8, 4 ring 30 in. by 24, 3 ring 50 in. by 24; that for 500 and 600 yd. range is 6 ft. by 6, with bull's-eye 24 in. by 18, 4 ring 48 in. by 36, and 3 ring 54 in. by 72; that for 800 and 1,000 yd. range is 6 ft. by 12, with bull's-eye 32 in. by 45, 4 ring 6 ft. by 51 in., and 3 ring 6 ft. by 6; bull's-eye counts 5, 4 ring 4, 3 ring 3, and outside of the 3 ring 2. In the skirmish firing, a standing, a kneeling and a lying down figure are grouped together 3 ft. apart and, when hit, count respectively 3, 4 and 5; 30 seconds only are allowed at a halt in skirmish firing and 20 shots in each run.

Sharp's Rifle. One of the earliest breech loaders, used in the Mexican war and during the civil war. The breech-block is hinged to the trigger guard and when the latter is pushed forward the block slides vertically downward and opens the breech; for the paper cartridge, its end being cut off by the sharp upper edge of the block when the guard is pulled back. It is fired by a percussion cap on the nipple of the block. The gas check is an undercut hollow in the front face of the block.

Sharswood, GEORGE, LL.D., 1810–1883. Pres. Phila. District Court 1848–67; law prof. Univ. Pa. 1850–67; Justice Pa. Supreme Court 1867; Chief-justice 1878–82. *Professional Ethics*, 1854; *Lectures on Common Law*, 1856. His edition of Blackstone, 1859, is much used.

Shasta, MT. Extinct volcanic peak in n. Cal. Elevation 14,442 ft.

Shastras, or SHASTERS. Commentaries on the Vedas, regarded as partaking of their sacredness and authority.

Shaubena, ab.1775–1859. Ottawa chief, lieutenant to Tecumseh 1807–13; opposed to Black Hawk 1832.

Shave-Grass. See SCOURING-RUSHES.

Shaving. See BEARD.

Shaw, ALBERT, b.1857. Ed. Minneapolis *Tribune* 1884–91. *Icaria*, 1884; *Co-operation*, 1886; *Revenues*, 1888; *Municipal Government in Europe*, 1895–96.

Shaw, ALBERT DUANE, b. 1841. U. S. Consul at Toronto 1868–78, and at Manchester 1878–85.

Shaw, GEORGE, M.D., 1751–1813. Keeper in British Museum from 1791. *Naturalist's Library*, 24 vols., 1790–1813; *Zoölogy*, 11 vols., 1800–19; *Lectures*, 1809.

Shaw, HENRY, b.1800. Anglo-American, founder of the St. Louis Botanic Garden 1870.

Shaw, HENRY WHEELER ("JOSH BILLINGS"), 1818–1885. American humorist. *Works*, 1877.

Shaw, LEMUEL, LL.D., 1781–1861. Chief-justice of Mass. 1830–60.

Shaw, ROBERT GOULD, 1837–1863. Col. 54th Mass., a colored regiment; killed at Fort Wagner, S. C.—His father, FRANCIS GEORGE, 1809–1882, was active in philanthropy.

Shaw, THOMAS, b.1843. Prof. of Husbandry in Ontario 1888, and Minn. 1893. *Agriculture*, 1890; *Weeds*, 1893.

Shawl. Article of fine wool, silk, or wool and silk, manufactured in the fashion of a large handkerchief, used in female dress. The principal varieties are: those of Cashmere (see CASHMERE GOAT); Crape shawls woven of hard-spun silk yarn in the gum or natural condition; Grenadines, made of silk; Chiné, made with the warp printed before weaving; Barege, a woolen fabric made at Bareges, France; and woolen shawls of various kinds. During the last thirty years the fashion for shawls has quite passed away.

Shawnees (SHAWANOES). Algonquin tribe of Indians of N. Y., driven before the invading Iroquois ab.1590. Some went s. and joined the Creeks (Tecumseh was half Shawnee, half Creek); some moved w. into Wis.; some joined the Delawares, and were concerned in Penn's treaty. The Western Shawnees moved e. and were driven into Tenn. by the Iroquois. The Southern Shawnees also emigrated n. and were driven s.w. into Ohio. They sided with the English in the Revolution. They now number ab. 1,600, prosperous and civilized, but much scattered among other tribes.

Shawmut. Indian village on site of Boston.

Shays's Rebellion. Outbreak in Mass. 1786–87, led by Daniel Shays (1747–1825); occasioned by the hard times after the Revolution. An attempt was made to seize the Springfield arsenal, but the militia put down the insurrection. Several of the insurgents were captured and sentenced to death, but afterward pardoned.

Shea, JOHN DAWSON GILMARY, LL.D., 1824–1892. American writer, chiefly on R. C. history in the New World.

Sheaf. Figure composed of lines or planes all passing through the same point, its center.

Sheaffe, SIR ROGER HALE, 1763–1851. B. in Boston; British officer from 1778; Major-gen. 1811; victorious at Queenstown 1812; defender of York (Toronto), and Baronet 1813; Lieut.-gen. 1821; General 1828.

Shear. Stress caused by two parallel forces acting in opposite directions and very near together, as that exerted by the blades of a pair of shears. Shearing stresses are of frequent occurrence in all engineering constructions; the shearing strength of materials is usually much less than the tensile strength.

Shear. Tool for shaping plate metal, and cutting off bar-metal by the action of a plane of metal. The shearing edge may be plane or curved, as for ship-plate work; it may be short, when the single driving mechanism used in punches will suffice (see PUNCH), or it may be long, when the holder must be driven at several points by such motions. The punch and shear are often combined in one machine, the driving mechanism as far as the last shaft being in common; the last shaft has the punch at one end and the shear at the other. Shears for angle iron and other special shapes require complementary shapes for the two shear planes. Rotary shears are used for thin metal, like zinc, and consist of two disks with beveled edges which revolve in parallel planes, and slightly overlap each other. Such shears will cut to varying or compound curved lines, which reciprocating shears will not do even with curved blades, but they are applicable to thin work only. Where curves are to be sheared in heavy work, it has to be done by punching round holes on the perimeter, and cutting out the serrations afterward.

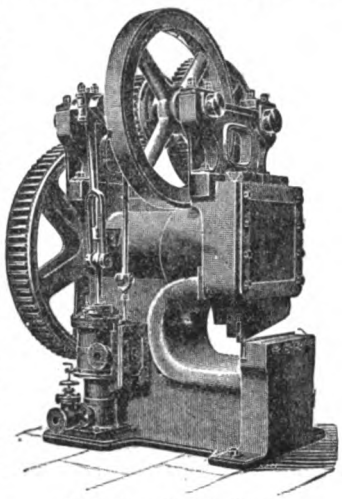
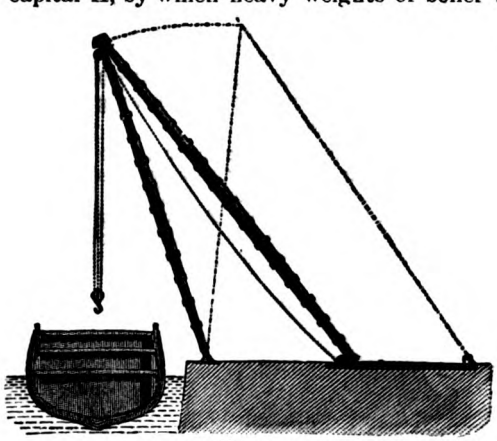


Plate Shearing Machine.

Shearman, THOMAS GASKELL, b. 1824 in England. Legal and political writer in New York. *Free Trade*, 1881; *Single Tax*, 1887; *Taxation*, 1890–91.

Shears. 1. Bed of a machine tool, upon which the tool carriages slide, guided by the beveled edges or by the tracks on it. 2. Plural of shear, for shearing metal by power, and for the ordinary hand-implements. 3. Pair of long spars, framed together by iron bracing so as to resemble a very slender capital A, by which heavy weights of boiler and engine are put into vessels, and the masts of such vessels are stepped. The upper end of the frame carries a purchase block, and the lower end is pinned to the ground. The spars have a slight slant forward from the bottom, and, by means of the guy ropes, a slight horizontal adjustment of the load is possible. Such temporary frames are used for erecting vertical poles or stacks; often called gin poles in this case.



Shears.

Shearwater. See SKIMMER, FULMAR, and RAZOR-BILL.

Sheath. In Agrostology, basal portion of the leaf of grasses, which clasps the stem above the node from which the leaf is developed.

Sheathbill. Antarctic Ralline bird, with pigeon-like appearance, white color, and a sheath on the base of the upper mandible. It feeds on sea-weeds, crustaceans, and eggs.

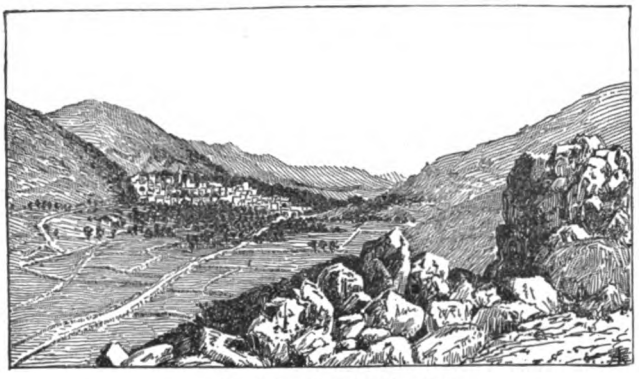
Sheathing. Material used for protecting ships' bottoms from the attacks of the teredo and other marine animals. Lead was first used, then sheet copper, but now sheet yellow metal, composed of copper 60, zinc 40 parts. It also prevents fouling by sea-weeds. See MUNTZ METAL.

Sheba. Kingdom of s. Arabia, whose queen visited Solomon (I. Kings x.).

Shebeen. Houses in Ireland and Scotland, where intoxicating liquors are sold without a license.

Sheboygan. Capital of S. co., Wis., on Lake Michigan, 52 m. n. of Milwaukee; incorporated 1853. Its manufactures are chiefly of furniture. Pop., 1890, 16,359.

Shechem. City of Samaria, in a fruitful valley between Mts. Ebal and Gerizim; now Nablous. Here Christ met the Samaritan woman (John iv.). In its most flourishing age, it



Nablous—Ancient Shechem.

was larger and had a greater population than the present Nablous. Nearby are various Scriptural localities, including Jacob's Well and the holy place of the Samaritans. Nablous pop. ab. 20,000.

Shechinah. Divine Indwelling or Presence in a visible form in Israel, as in the cloud and fire in the wilderness, or at the dedication of Solomon's temple; absent in the second temple.

Shecut, JOHN LINNÆUS, M.D., 1770–1836. Physician at Charleston, S. C.; writer on medicine and electricity. *Flora Caroliniensis*, 1806.

Shedd, JOEL HERBERT, b.1834. Civil and hydraulic engineer; designer of the water-works at Providence, R. I.

Shedd, WILLIAM GREENOUGH THAYER, D.D., LL.D., 1820–1894. Prof. Univ. Vt. 1845–52, Auburn 1852, Andover 1853, and Union Theol. Sem., New York, 1863–90. *Hist. Christian Doctrine*, 1863; *Homiletics and Pastoral Theology*, 1867; *Dogmatic Theology*, 1889–94.

Shee, SIR MARTIN ARCHER, R.A., 1770–1850. Irish portrait-painter, pres. Royal Academy from 1830; knighted 1830.

Sheeahs. See SHIITES.

Sheep. The Himalaya Mts. appear to be the center from which sheep of all species have originally spread. In N. America is *Ovis montana*, the Big Horn and the Musk-Ox. They seem to have come from Siberia. A few stragglers occupy the mountains of Europe and n. Africa. All the other wild species are Asiatic, and confined to elevated peaks. Both male and

Big Horn (*Ovis montana*).

female of wild forms have horns, but these are larger in the male. The coat of wild forms has more hair than wool. The Big Horn attains a wt. of 350 lbs. They rut in December; the lambs are born in March. The Maned Sheep of the Atlas Mts. is 3 ft. high, 6 ft. long, and has long hair pendent from the neck and breast. The original color of domestic sheep was probably dark brown. Its domestication was prehistoric. Wool and mutton, the two products of sheep, have given rise to the types of the different breeds, though there has been an effort, attended with some success, to produce both profitably in one animal. The different breeds are treated under their respective names. An adult male is properly a ram, and when castrated a wether; the female is a ewe, the young a lamb. In England various terms are used to denote various ages and sexes, but they are unknown in the U. S.

CHEVIOT.—Breed of long-wooled English mutton sheep, with

Cheviot Ewe.

Leicester Ram.

white faces. They come from the border between England and Scotland, and are active, hardy, and vigorous.

COTSWOLD.—Breed of long-wooled, white-faced English mutton sheep, much resembling the Leicesters. The wool grows more on the top of the head, and they are coarser-limbed and more robust. In U. S. they are generally preferred to the Leicester.

DORSET.—English breed of mutton sheep. The wool is medium in length and rather coarse. The face and legs are white, and both males and females have horns. Their bodies are long and well-formed, and they take on flesh readily and rapidly. They are chiefly valued for their prolificacy and heavy milking qualities, usually bearing two and often three lambs at a birth, and breeding twice a year.

DOWN SHEEP.—Class of English mutton sheep. Several different breeds are recognized, differing in size and intensity of black markings. In general they bear wool of medium length and fineness. They are short-legged and squarely built, and the legs and faces are brown, gray-brown or black. The lambs are often dark-colored at birth. The best-known breeds are the Southdown, Shropshire Down, Hampshire Down and Oxford Down.

LEICESTER.—Breed of long-wooled, white-faced English mutton sheep. Their characteristics were greatly improved by Robert Bakewell, largely by means of close inbreeding. They are still one of the largest breeds, but somewhat lacking in vigor, though they have been used to improve most of the long-wooled breeds.

MERINO.—Breed of sheep chiefly valued for wool. They originated in Spain, but have been carefully bred and improved in U. S. nearly 100 years. The wool is very fine and

Merino Sheep (*Ovis aries hispanica*).

abundantly supplied with oily secretions. The skin is thrown in folds about the neck and shoulder, so that the animal has a wrinkled appearance. The rams usually have horns.

MERINO-MUTTON.—Branch of the Merino produced by careful breeders, in which, while the superior weight and fineness of

the wool have been largely retained, the carcass has been increased in size and the folds of the skin have been obliterated. Several families of this breed, differing but slightly in character, are known by separate names, as Blacktop, Dickinson, and Delaine Merinos. In 1896 there were 38,298,783 sheep in U. S. valued at $65,167,755. See OVIDÆ and WOOL.

Sheep-Berry. *Viburnum lentago.* Small tree of the natural family *Caprifoliaceæ*, native of the e. U. S.; known as Sweet Viburnum and Nanny-berry. The latter also indicates a related species, *V. prunifolium.*

Sheep Rot. Distemper caused by the presence of liver-flukes, *Distoma hepaticum*, in the liver. The germs are swallowed with the food. Humid soil, herbage, and atmosphere also promote it. See DISTOMUM.

Sheepshanks, JOHN, 1787–1863. Art-patron who made a collection of the paintings of modern English artists and presented them to the English nation in 1856. They are stored at S. Kensington.

Sheepshead (DIPLODUS). Acanthopterygian fish of the family *Sparidæ*. It has broad cutting teeth in front and several rows of grinders like the Porgy. It is strictly confined to salt water in the North, but in Florida has been known to ascend rivers. Oyster and clam beds form its favorite feeding grounds. It bites off barnacles and young oysters when attached to rocks and timber. It is a game fish, and is caught with strong tackle. It averages 6 or 8 pounds in weight, and spawns at the mouths of rivers (probably in the South) early in the spring.

Sheep Stealing. Felony in Gt. Britain, formerly punishable with death.

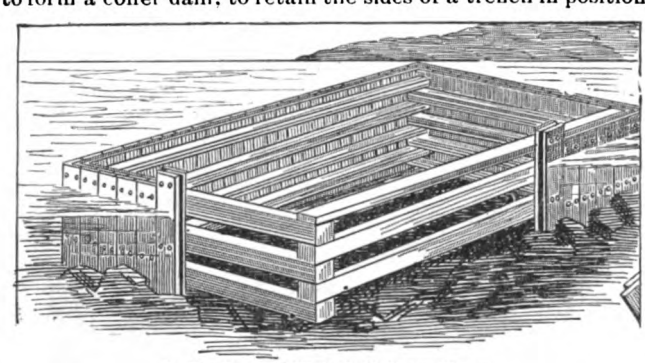
Sheep-Tick. See HIPPOBOSCIDÆ.

Sheeraz. See SHIRAZ.

Sheerness. Seaport in Kent, 52 m. e. of London; taken by the Dutch 1657; scene of a mutiny 1798; noted for its harbor and dockyard. Pop., 1891, 13,841.

Sheet. Rope fastened to one or both the lower corners of a sail for extending and retaining it in a particular position.

Sheet Piling. Planks or timbers driven in close contact to form a coffer dam; to retain the sides of a trench in position,



Coffer Dam of Wakefield Sheet Piling.

or to sustain a filling in of earth, masonry, or other material. The planks are usually tongued and grooved and driven between two principal piles.

Sheffey, DANIEL, d.1830. M.C. from Va. 1809–17; noted for oratory.

Sheffield. City of w. Yorkshire, on the Don, at the mouth of the Sheaf, Eng.; celebrated for its manufactures of cutlery and hardware. Its importance is chiefly recent. Pop., 1891, 324,243.

Sheffield, JOHN, DUKE OF BUCKINGHAMSHIRE, 1649–1721. Official in three reigns; author of plays and poems.

Sheffield, JOSEPH EARLE, 1793–1882. Benefactor of the Yale scientific school, named from him 1860.

Sheffield Scientific School. See YALE UNIVERSITY.

Sheikh. Chief of an Arab tribe; also Mohammedan scholar, saint, or head of an order.

Sheil, RICHARD LALOR, 1791–1851. Irish M.P. 1829–38; eminent as an orator, and, in early life, as an agitator; author of several successful plays. *Sketches of the Irish Bar*, 1822, repub. 1855.

Shekel. Hebrew weight, ab.220 grains; later, ab.150 B.C., a silver coin, usual value ab. 50c.; struck also in gold and copper.

Shelburne, WILLIAM PETTY FITZ-MAURICE, EARL OF, 1737–1805. Cabinet Minister 1763, 1766–68, and 1782; Premier 1782–83; Marquis of Lansdowne 1784.

Shelby, ISAAC, 1750–1826. Officer in border wars from 1774, and in S. C. 1780–82; prominent at King's Mountain Oct. 7, 1780; Gov. of Ky. 1792–96 and 1812–16; in arms with Gen. Harrison in Canada 1813. A college and nine counties are named from him.—His father, EVAN, 1720–1794, pioneer and Indian fighter, won the battle of Point Pleasant 1774.—His descendant, JOSEPH ORVILLE, 1831–1897, was a Confederate general.

Sheldon, EDWARD L., 1849–1892. American writer and financier, in London from 1876. His *Pocket Encyclopedia* circulated widely.—His wife, MAY FRENCH, m. 1876, is an African traveler.

Sheldon, EDWARD STEVENS, b.1851. Prof. Harvard since 1884; philological writer.

Sheldon, GILBERT, D.D., 1598–1677. Bp. of London 1660, Abp. of Canterbury 1663; founder of the Sheldonian theater at Oxford 1669.

Sheldon, HENRY CLAY, D.D., b.1845. Prof. Boston Univ. since 1875. *Hist. Doctrine*, 1886; *Hist. Ch.*, 5 vols., 1894.

Sheldrake. 1. *Tadorna.* Large European marine duck, with head and neck green-black, white collar around lower neck, and broad chestnut-brown one at shoulders; primaries of wing green, the middle of under parts black, rest of plumage white. In Jutland the Danes protect this duck, providing holes for it to breed in; they remove the eggs, beyond six, of each nest, and after the nest is abandoned remove the fine down which lines it. 2. *Lophodytes.* Hooded or crested merganser of America. It has a black bill, white crest in male, reddish in female, and upper parts black or grayish brown respectively. See ANATINÆ.

Shell. Hollow projectile with a bursting charge to be ignited by a fuse at or before striking. Shell-proof applies to magazines, covers for men and material, which will prevent shells from penetrating; more particularly applied to spherical shells, now practically obsolete, and specifically called bomb-proof.

Shellac. See LAC.

Sheller, ALEXANDER, b.1838. Russian novelist, poet, and historian of Communism.

Shelley, HARRY ROWE, b.1858. American organist, composer of many secular and sacred songs, a cantata, *Vexilla regis prodeunt*, two symphonies, and many smaller pieces.

Shelley, PERCY BYSSHE, 1792–1822. English poet of delicate genius and lofty purposes, but erratic in opinions and conduct; expelled from Oxford 1811; resident in Italy from 1817; drowned in the Bay of Spezia. His chief works are *Queen Mab*, 1813; *Alastor*, 1816; *Revolt of Islam*, 1818; *Prometheus Unbound*, 1820;

Percy Bysshe Shelley.

The Cenci, 1820; *Adonais*, on Keats, and *Hellas*. Some of his lyrics, as *The Cloud* and *To a Skylark*, are of exceeding beauty. The history of his first marriage with Harriet Westbrook (1795–1816), 1811, deserted 1814, is a lamentable tragedy.—His second wife, MARY WOLLSTONECRAFT (GODWIN), 1797–1851, wrote the famous *Frankenstein*, 1818, and other novels.

Shell-Flower. See BALMONY.

Shell Glands. Those within the shell of *Crustacea* that have a kidney function. See GREEN GLAND.

Shell-Heaps. Heaps of shells occupying an area of 10 to 40 acres and from 10 to 100 ft. deep are found on the Atlantic coast of the western hemisphere, and are the deposits of the North American aborigines; the KITCHEN-MIDDENS (q.v.) of Mollusk-eating peoples. Upon decomposition they yield a rich marl which is very fertile. The shells are also calcined and used for fertilizer.

Shell Lime. Made by calcining oyster shells; used like common lime for making mortar and purifying illuminating gas.

Shell Pump. See SAND PUMP.

Shell-Sand. Sand consisting of shell fragments and containing some organic matter, found on the British coast. It is used as a manure, for soils deficient in lime and on reclaimed peat bogs, the lime neutralizing the organic acids in the peat and forming plant food.

Shelook. Hot dry wind in s. Arabia, not essentially different from the Sirocco.

Shelta, or SHELRU. Secret jargon spoken by Irish beggars, tinkers and pipers.

Shelter. Any cover to protect troops while in active service, as tents; also, irregularities of the ground by which troops are protected from the direct fire of the enemy.

Sheltered Thermometer. One inclosed in any sort of shelter that protects it from the direct radiation of sun, sky, and ground, yet allows free access of air or wind and the attendant convection of heat.

Shelter Island. Summer resort w. of Gardiner's Bay, e. Long Island, 14 m. long by 4 m. wide. Pop., 1890, 920.

Shelton, FREDERICK WILLIAM, 1814–1881. American author of tales and sketches.

Shem. Eldest of the three sons of Noah, and ancestor of the Hebrews and their related tribes.

Shenandoah. River of Va., w. of Blue Ridge, flowing n.e. to the Potomac at Harper's Ferry. Length 170 m. Its valley was much fought over 1862–64.

Shenandoah. Borough of Schuylkill co., Pa., in one of the anthracite coal fields. Pop., 1890, 15,944.

Shenandoah. Confederate cruiser, which sailed from London as the *Sea King*, Oct. 8, 1864, destroyed a number of U. S. merchant ships, and did much damage to the whaling vessels in Bering Sea; a total of 38 ships were captured.

Shenshin, AFANASY, b.1820. Russian poet and translator.

Shenstone, WILLIAM, 1714–1763. English descriptive poet. *The Schoolmistress*, 1742.

Sheol. Place of departed spirits, alike good and bad. See HADES.

Shepard, CHARLES UPHAM, M.D., LL.D., 1804–1886. Assistant in geological survey of Conn. 1835; Prof. of Chemistry at Amherst 1845–52, and in S.C. Medical Coll. 1854–61; student especially of meteorites: discoverer of phosphatic deposits in S. C. *Mineralogy*, 1832–55.—His son and namesake, b.1842, was also prof. at Charleston 1867–83, and continued his work.

Shepard, ELLIOT FITCH, 1833–1893. Ed. New York *Mail and Express* from 1888.

Shepard, THOMAS, 1605–1649. Pastor at Cambridge, Mass., from 1636. His writings were collected 1853.

Shepardson College. See DENISON UNIVERSITY.

Shepherd Dog. Dark-colored, shaggy dog ab. 15 in. high, with semi-erect ears, and recurved bushy tail. It is very intel-

Shepherd Dog (*Canis familiaris domesticus pecuarius*).

ligent, courageous, quiet, but suspicious of strangers. The Scottish collie is one variety. In S. America these dogs attend to sheep without the aid of man. They have a good deal of the wolf nature, and will kill sheep in a stranger's flock.

Shepherd Kings, or HYKSOS. From the East, according to Manetho; conquered Egypt without a battle, destroyed the temples, enslaved the people, and ruled 511 years. Eusebius assigns to them one dynasty and 103 years. R. S. Poole says dynasties XV. and XVI. were probably theirs. Rawlinson thinks they were Hittites. The last of them was Apepi or Apophis, under whom Joseph may have ruled Egypt. Their rule began, some say, 2200, some 1720 B.C.

Shepherd of Hermas. See HERMAS.

Shepherd's-Purse. *Bursa-bursa pastoris.* Weed of the natural family *Cruciferæ*, bearing white flowers and triangular pods; native of Europe, but now found almost everywhere.

Shepley, ETHER, LL.D., 1789–1877. U. S. Senator 1833–36; Judge Me. Supreme Court 1836; Chief-justice 1848–55.—His son, GEORGE FOSTER, LL.D., 1819–1878, was U. S. Dist.-atty. for Me. 1853–61; Brig.-gen. U. S. Vols. 1862; military gov. of New Orleans 1862, La. 1862–64, and Richmond 1865; Judge Me. Supreme Court 1865, and U. S. circuit judge from 1869.

Sheppard, ELIZABETH ("E. BERGER"), 1830–1862. English novelist. *Charles Auchester*, 1853; *Counterparts*, 1854.

Sheppard, JACK, 1702–1724. English robber and jail-breaker, hero of many legends; celebrated by H. Ainsworth 1839.

Sheppey, ISLE OF. At the mouth of the Medway, Kent; noted for its fossils and the gradual encroachment of the sea. Extent 9 m. by 4 m.

Sherbet. Sweetened fruit juices, diluted with water and cooled or frozen; in the latter case called Ices.

Sherbrooke, ROBERT LOWE, VISCOUNT, LL.D., D.C.L., 1811–1892. M.P. 1852; Chancellor of the Exchequer 1868–73; Home Sec. 1873–74; Viscount 1880.

Sheridan, PHILIP HENRY, U.S.A., 1831–1888. Brig.-gen. U. S. Vols. 1862. Major-gen. 1863; serving in the West till 1864; distinguished at Murfreesboro, Chickamauga, and Missionary Ridge, Tenn.; commander of cavalry in Va. 1864, and next of the Army of the Shenandoah, with which he thrice

General Sheridan.

defeated Gen. Early, turning the rout at Winchester, Oct. 19, into victory; Brig.-gen. U.S.A. Sept. 20. Major-gen. Nov. 8; prominent in the last actions of the war, Feb.–April 1865, especially at Five Forks; Lieut.-gen. 1869; Commander U.S.A. 1883; General 1888.

Sheridan, RICHARD BRINSLEY BUTLER, 1751–1816. Irish dramatist, orator, and wit. M.P. 1780–1812; owner of half Drury Lane Theater, London, from 1776, and later of the whole. His chief plays, *The Rivals*, 1775, *School for Scandal*, 1777, and *The Critic*, 1779, are notable for brilliant dialogue and characterization, but loose in plot. His habits were easy, and his later life was clouded by debts and poverty. *Speeches*, 5 vols., 1816. His grandfather, THOMAS, D.D., 1684–1738, was a friend of Swift; his father, THOMAS, 1721–1788, actor and elocutionist, pub. a *Life of Swift* and an English *Dictionary*, 1780; his mother, FRANCES (CHAMBERLAINE), 1724–1766, wrote several novels and plays.

Sherif, or SHEREEF. Descendant of Fatima, Mohammed's daughter.

Sheriff. Chief executive officer and conservator of the peace of a county. In Gt. Britain he is appointed by the Crown, and often possesses judicial functions, being the chief county judge in Scotland; in the U. S. he is generally elected by popular suffrage, and rarely has judicial powers.

Sheriffmuir. Near Dumblane, Perthshire, Scot.; scene of an indecisive engagement, Nov. 13, 1715, between the royalist troops under the Duke of Argyll and 8,400 Scottish rebels under the Earl of Mar.

Sherlock, WILLIAM, D.D., 1641–1707. Dean of St. Paul's, London, 1691; prolific writer. His *Discourse concerning Death*, 1689, was much admired.—His son, THOMAS, D.D., 1678–1761, Bp. of Bangor 1728, of Salisbury 1734, and of London 1748, declined the primacy 1747, and was an eminent preacher and controversialist. *Prophecy*, 1725; *Trial of the Witnesses of the Resurrection of Jesus*, 1729.

Sherman, FRANK DEMPSTER, b. 1860. American poet. *Madrigals*, 1887; *Lyrics*, 1890.

Sherman, JOHN, b.1823. Brother of the general; M.C. from Ohio 1855–61; U. S. Senator 1861–77 and 1881–97; pres. Senate 1885–87; Sec. Treasury 1877–81; Sec. of State 1897. *Speeches*, 1879; *Recollections of Forty Years*, 1895.

Sherman, ROGER, 1721–1793. Judge Conn. Superior Court 1766–89; assistant 1766–85; in Congress 1774–91; signer of the Declaration of Independence; one of the (official) framers of that document, of the Articles of Confederation, 1777, and of the Constitution, 1787; Mayor of New Haven from 1784; U. S. Senator from 1791.

Sherman, THOMAS WEST, U.S.A., 1813–1879. Brig.-gen. U. S. Vols. 1861, serving in S. C., Tenn., and La.; Major-gen. U.S.A. 1870.

Sherman, WILLIAM TECUMSEH, U.S.A., 1820–1891. Brig.-gen. U. S. Vols. 1861; Major-gen. May 1862, after the battle of Shiloh, Tenn.; prominent under Grant at Vicksburg and Chattanooga; commander of the Southwest 1864; famous for his

General Sherman.

march through Ga. and to the sea; captor of Atlanta Sept. 1, 1864, and of Savannah Dec. 21; Major-gen. 1864, Lieut.-gen. 1866, General 1869; in Europe 1872; retired 1874. *Memoirs*, 1875–86.

Sherry. Wine grown in Spain in the neighborhood of Jerez. It is originally white, made from white grapes, chiefly the Pedro Ximenes. It becomes dark with age or by the addition of arrope, made by boiling down grape juice. The grapes remain on the vines until they begin to dry, then are sprinkled with gypsum, pressed, and the juice left in the fermenting tubs till March. For Amontillado wines the grapes are gathered three weeks earlier, therefore the wine is drier. Montilla wines have more flavor and are used in the soleras or old stocks. Manzanilla wines are so called from the resemblance of their flavor to chamomile; they are generally lighter wines. Sherries have from 15 to 25 per cent of alcohol, from none up to 18 grs. of sugar per oz., and acidity equal to 3.5 to 5 grs. per oz. of tartaric acid. For export it is usually fortified by the addition of brandy. It is chiefly exported to England, 2,135,969 gals. being sent there 1891.

Sherwood, MARY MARTHA (BUTT), 1775–1851. English author, mainly of religious tales for the young. *Lady of the Manor.*

Sherwood, SIDNEY, b.1860. Prof. of Political Economy at Johns Hopkins Univ. 1892.

Sherwood Forest. In w. Nottinghamshire; once a royal hunting-ground; scene of Robin Hood's legendary deeds. Extent 8 m. by 25 m.

Shetland. See HORSE.

Shetland Islands. N.e. of Scotland; over 100, 23 inhabited; originally occupied by Picts; visited by Christian missionaries ab.800; rendezvous for northern vikings. They were under the rule of Norway in 876; and were annexed to Scotland 1471, and again in 1615. The Norse language had not quite died out ab.1775. Area 551 sq. m.; pop., 1891, 28,711. See ORKNEY ISLANDS.

Shevchenko, TARAS GRIGOROVICH, 1814–1861. Russian lyric and epic poet, in youth a serf, and under government censure 1847–57.

Shewbread. Twelve unleavened cakes, renewed daily or weekly in the Jewish tabernacle and temple.

Shibboleth. Watchword or test of a party; first used by the Gileadites after routing the Ephraimites, who, being unable to pronounce the *sh*, were slain.

Shield. Piece of defensive armor, held on the left arm, from earliest times till firearms came into use, to protect the body in war; of various materials and sizes; still used by savages, and in heraldry.—Also steel plates to protect men serving machine-guns from small-arm projectiles; and rope mantlets, metal plates and similar devices to cover the embrasure throat in siege batteries.

Shield, WILLIAM, 1748–1829. English composer of songs, anthems, and operas.

Shield-Fern. Ferns of the genus *Dryopteris* (*Aspidium*), growing in nearly all parts of the world; distinguished by the shield-shaped indusia which cover the sporangia when young; known also as Wood-fern.

Shields, CHARLES WOODRUFF, D.D., LL.D., b.1825. Prof. Princeton since 1865; writer on liturgics, 1864, and Ch. unity, 1891–94. *Philosophia Ultima*, 1877–89; *United Ch. of the U. S.*, 1896.—His father, PATRICK HENRY, 1773–1848, was a pioneer and judge in Indiana.

Shields, JAMES, 1810–1879. B. in Ireland; Judge Ill. Supreme Court 1843; Brig.-gen. 1846–48, in war with Mexico; U. S. Senator from Ill. 1849–55, and from Minn. 1858–59; Brig.-gen. U. S. Vols. 1861–63, serving in Va.

Shields, NORTH. Town of Northumberland, on the Tyne, near its mouth; old, but of recent commercial importance; part of TYNEMOUTH (q.v.).

Shields, SOUTH. Seaport of Durham, dating from Roman times; on s. bank of the Tyne, opposite N. Shields. It has a pier a mile long, and large shipping interests. Pop., 1891, 78,431.

Shiites, or SHEAHS. Adherents of the great Mohammedan heresy, principally represented by Persia, which maintains Ali, Mohammed's cousin and son-in-law, to have been his true successor, rejecting the three intermediate caliphs. See MOHAMMEDANISM.

Shillaber, BENJAMIN PENHALLOW, 1814–1890. American humorist. *Life and Sayings of Mrs. Partington*, 1854.

Shillelagh. Irish cudgel, named from a forest in s.w. Wicklow.

Shilleto, RICHARD, 1810–1876. English editor of Thucydides and Demosthenes.

Shilling. English silver coin, since 1504 $\frac{1}{20}$ pound or 12 pence; equal to 24.3 cents U. S.

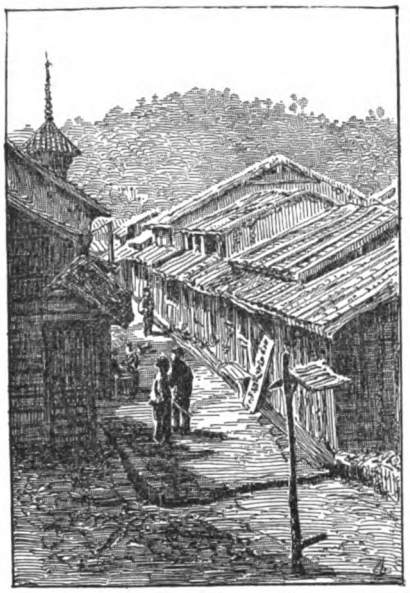
Shiloh. Ancient city of Ephraim and sanctuary of Israel; site of the tabernacle and ark ab.1444–1116 B.C.; 20 m. n. of Jerusalem; ruined before 600 B.C.

Shiloh, BATTLE OF. In Hardin co., Tenn., near Pittsburg Landing on the Tennessee, April 6–7, 1862. Gen. Grant, with ab. 33,000 men, was attacked and driven back by over 40,000 Confederates under Gen. A. S. Johnston, who was killed and succeeded by Gen. Beauregard. On the 7th the Union army, being heavily re-enforced, was victorious, with a loss of 1,754 killed and ab. 13,000 in all. The Southern losses were nearly equal.

Shim. Thin block of wood placed upon a cross tie under a railroad rail, to keep it in line and grade temporarily. Shims are mostly used in the winter, when it is difficult to move the cross tie.

Shimeall, RICHARD CUNNINGHAM, 1803–1874. American writer on prophecy. *Bible Chronology*, 1859.

Shimonoseki. Town of Japan, at s.w. end of Nippon: bombarded by European and American vessels 1864; made a port of entry 1890. Pop. ab. 15,000.



Street in Shimonoseki

Shimonoseki, TREATY OF. Signed April 17, 1895. Corea was declared independent, Formosa and Manchuria ceded to Japan, and China opened to foreign commerce and manufactures. Russian interference modified these results.

Shinar. Mesopotamian plain around Babylon.

Shindler, MARY STANLEY BUNCE (PALMER), (MRS. C. E. DANA), b.1810. American poet. *Northern Harp*, 1841. Two of her hymns have been much used.

Shingles (HERPES ZOSTER). Eruption of vesicles on a reddened surface, usually located at the waist and extending half around the body; it is frequently accompanied by neuralgic pain. See HERPES.

Shin-Leaf. Low perennial herbs of the genus *Pyrola*, natural family *Pyrolaceæ*, natives of n. temperate zone; erroneously called Wintergreen.

Shinn, WILLIAM POWELL, 1834–1892. American civil and mining engineer.

Shinney. See HOCKEY.

Shin-Shiu. Reformed Buddhist sect, founded in Japan ab.1250.

Shintoism. Official and national religion of Japan, called by the Japanese *Kami no michi*, "way," or "doctrine of the gods." Its chief book is the *Ko-ji-ki*, or *Records of Ancient Matters*, a collection of cosmical myths and legendary history in which many generations of deities are enumerated, down to Jimmu Tenno, the first mikado and founder of the present imperial family, who is said to have reigned 660–585 B.C. Shintoism has no idols. It teaches the immortality of the soul and an eternal future life of recompense or punishment. It ordains purity of life, and respect, almost adoration, to the emperor, the direct descendant of the gods and spiritual and temporal chief. Its priests are not required to submit to obligations of celibacy or abstinence, and their office is usually hereditary.

Shipbuilding. The earliest ship known is Egyptian, dating 3,000 B.C. It was of considerable size, with 52 oars and a mast, sail and 5 oars steering on either side. The two ends rose to a point, or the rear end was rounded for the stern. War vessels had a metal prow, used as a ram. The Greek and Roman war vessels were propelled by oars. The trireme was 150 ft. long and 18 ft. beam, with 174 rowers; this dates from 700 B.C. The Phœnician ships had sails, and Herodotus describes vessels with rudders on the Nile. The Viking warship had both rowers and a sail; one has been found 78 ft. long and 7 ft. beam, with 32 oars. The Byzantine war vessels of Leo VI., ab.900, were biremes and galleys propelled by oars. The English ships of 1190 were small sailing vessels. In the 15th century considerable progress was made by the French and Spaniards, and some large ships were built in England, one of which was 165 ft. long and 46 ft. beam. The *Santa Maria* of Columbus was 90 ft. keel and 29 ft. beam. In the 17th century the English made much advance in shipbuilding, but in the following century Spain, France, Denmark and Sweden were far in the lead, both as regards speed and behavior of their ships. In the 19th century the British have become the largest shipbuilders, now mostly using iron and steel in their construction. The first ship built in America was the *Virginia*, 60 ft. long, on the Kennebec River 1640. From 1812 to 1850 shipbuilding flourished in U. S. In 1841 the first China clipper-ship was built by Webb of New York, and also in 1849 the first three-deck ship. The clippers were fast sailers, the *Sovereign of the Seas* making 5,391 m. in 22 days; the *Great Republic* was 325 ft. long, 53 ft. beam, and 4,000 tons burden. In New England many vessels for the whale fishery were built. Many of the English merchantmen now have auxiliary steam-power, by which 7 m. per hour can be attained without the sails. The first steamboat was made by Denis Papin 1707, who propelled a boat with paddlewheels on Fulda River. James Rumsey, an American, propelled a vessel 4 m. per hour by forcing a jet of water through the stern with steam-pumps in 1786. John Fitch, also an American, propelled a vessel with paddlewheels in 1785. Robert Fulton, an American, built a steamboat in Paris in 1803. In 1807 he built the *Clermont*, 133 ft. long, which steamed from New York to Albany, 142 m., in 32 hours. This was the first commercial success of this class of boats. Iron canal-boats were made in England 1787, and iron steamboats with paddlewheels in 1821. John Ericsson used the screw-propeller on the Thames 1836. The Cunard line of Atlantic steamships was established 1840, and the Collins line of American-built steamships in 1850. The Pacific Steam-Navigation Co. in 1856 used a compound engine. The *Aberdeen* in 1881 used a triple-expansion engine, and the New Zealand Shipping Co. employ the quadruple-expansion engines. In 1888 the American line introduced the twin-screw. In 1856 the Atlantic voyage westward was made by steamships in 11d. 19h.; in 1874 the *Britannic* made it in 8d. 6h.; in 1886 the average time, between Queenstown and Sandy Hook, was 6d. 15h. In 1897 the *Kaiser Wilhelm der Grosse*, of the North German Lloyd Steamship Co., made the passage from Southampton to New York in 5d. 22h. 45m. This is the largest ship afloat, being 648 ft. long, 66 ft. beam, 43 ft. deep, and of 14,000 tons burden; her speed per hour is 22 knots, and her engines are triple expansion. The shipbuilding in 1896 was: Great Britain 1,316,906 tons; United States, year ending June 30, 1897, 177,643 tons; Germany, 54,075 tons; Norway, 2,522 tons; Denmark, 13,190 tons; Austria, 6,686 tons. The price in 1897, in Great Britain, for building vessels of medium size, was £7 per ton, an increase over 1896 of £1. In 1896 the tonnage of merchant ships in trade was: Great Britain, 13,563,597; United States, 4,703,880; Germany, 1,930,460; Norway, 1,705,722; France, 1,148,970; Italy, 821,553; Sweden, 552,888; Netherlands, 497,451; Denmark, 388,540; Greece, 385,935; Austria-Hungary, 295,805; Belgium, 132,464. The United States had 1,193 vessels, tonnage 829,833, in foreign trade, and 20,030 vessels, tonnage 3,790,296, in coastwise trade; there were 64 vessels engaged in whale-fishing, and 1,621 vessels in cod and mackerel fishing. In 1850 the tonnage of merchant ships in trade was: Great Britain, 4,232,962; United States, 3,485,266; France, 688,153; Norway, 298,315; Holland, 292,576; Belgium, 34,919. See BARK, BIREME, BRIG, BULKHEADS, CANOE, CARAVEL, COLUMBUS, CUTTER, GALLEY, GREAT EASTERN, MARINE BOILER, MARINE ENGINES, RIGGING, SCHOONER, SCREW-PROPELLER, SLOOP, STEAMBOATS, TRIREME, VIKINGS and YACHT.

Ship Canals. The Languedoc Canal, between the Bay of Biscay and the Mediterranean, was completed 1681, at a cost of $7,200,000; it is 140 m. long and has 119 locks. The Caledonia Canal, in Scotland, finished 1823, cost $5,000,000; it is 60 m. long, 38 m. of which are a chain of lakes, and it has 28 locks. The North Holland Canal, built 1825 as an approach to Amsterdam, is 52 m. long, with two entrance locks at the ends; its cost was ab. $5,000,000. The Corinth Canal, begun by Nero, was completed 1892; it is 4 m. long, and cost nearly $9,000,000. The Baltic Canal, completed 1895, is 61 m. long, and has 4 large tidal locks. See also CALEDONIAN CANAL, CHICAGO CANAL, MANCHESTER CANAL, NICARAGUA CANAL, NORTH SEA AND BALTIC CANAL, PANAMA CANAL, SAULT STE. MARIE CANAL, SUEZ CANAL, and WELLAND CANAL.

Ship Fever. See TYPHUS FEVER.

Shipka Pass. In Balkan Mts., 50 m. n.e. of Philippopolis; held by Russians against Turks Aug. 21–26 and Sept. 9–17, 1877.

Shipley, ORBY, b.1832. High Anglican writer and compiler, R.C. since 1878.

Ship-Money. Tax arbitrarily levied by Charles I. 1634–40, to furnish a navy; opposed by Hampden and others; one of the main abuses leading to the revolt of Parliament and the civil war.

Ship of Fools. See BRANT, S.

Shipp, ALBERT MICAIAH, 1819–1887. Prof. in N. C. and S. C., and from 1874 at Vanderbilt Univ. *Hist. Methodism in S. C.*, 1882.

Shippen, EDWARD, 1639–1712. Mayor of Phila. 1701; acting gov. of Pa. 1703.—His great-grandson, EDWARD, LL.D., 1729–1806, was a judge of Pa. Supreme Court 1791–99, and Chief-justice 1799–1805.—His cousin, WILLIAM, M.D., 1736–1808, was the first lecturer on anatomy in U. S. 1762, prof. in the first medical school (incorporated in Univ. Pa. 1791) 1765–1806, and director-gen. of military hospitals 1777–81.

Shipping, LAW OF. Legal rules governing those engaged in the business of navigation; many of them are purely statutory. The master of a ship bears great responsibilities and is clothed with extraordinary authority over the crew, passengers, cargo, and vessel.

Shipping Master. See SHIPPING, LAW OF.

Ship-Railways. These are designed to transport vessels overland from one waterway to another. There was one at Corinth, Greece, 400 B.C., on which ships 150 ft. long were carried. In 1438 and 1440 war vessels were carried overland 90 m. to Lake Garda by the Venetians. Canal-boats are carried on inclined planes from one level to another of the Morris and Essex Canal, N. J. The Chignecto ship-railway, to transport ships of 1,000 tons' weight of cargo, 2,500 tons total, from the Gulf of St. Lawrence to the Bay of Fundy, 17 m. in length, was under construction 1888. Lifting-docks are provided at each terminus and a large basin in the Bay of Fundy to protect vessels from the tides. It is not yet completed. A ship-railway for the Isthmus of Suez was proposed 1860, and for the Isthmus of Tehuantepec, Mexico, 1879, the latter by James B. Eads.

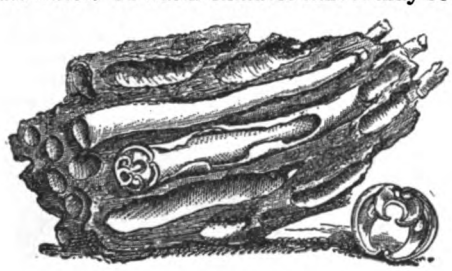
Ship's Husband. Part-owner or other person who has authority to act for all owners in providing for the general affairs of the ship.

Ship's Magnetism. This is chiefly due to the permanent magnetism of the iron in the ship, and is therefore much greater in iron than in wooden vessels. The deviation of the compass on wooden vessels, due to this cause, is not more than 10°; in iron ships it is sometimes 30°. This may be corrected by magnets. The quadrantal deviation of the compass is due to induced magnetism, and in wooden ships may amount to 2°, in iron ships to 8°.

Ships of War. See BATTLESHIP, CRUISER, GUNBOAT, ARMOR PLATES FOR WARSHIPS, TORPEDO BOAT, CORVETTE, and MONITOR.

Shipton, URSULA (SOUTHIEL), 1488–ab.1560. English "prophetess" of posthumous fame, heroine of many apocryphal tales, mostly collected or invented by R. Head 1684.

Shipworm. Lamellibranch Mollusks of the genus *Teredo*, which bore into the sides of wooden ships and timber constructions in salt water. In warm climates timber may be destroyed



Common Shipworm (*Teredo navalis*).

in a few months. The only effective remedy is to impregnate the timber with creosote, or protect it with copper or yellow metal. See PHOLADIDÆ.

Shiras, ALEXANDER EAKIN, U.S.A., 1812–1875. Commissary of subsistence from 1847; Brig.-gen. 1874. His services were important during the Civil War.

Shiras, GEORGE, LL.D., b.1832. Lawyer of Pittsburg, Pa.; Justice U. S. Supreme Court 1892.

Shiraz. Capital of Fars, Persia, and long of the Muzaffar dynasty; founded ab. 700, and for 500 years a splendid city, famous for its wine and roses, and for the tombs of Hafiz and Saadi; praised by poets; taken by Tamerlane ab.1380; damaged by earthquakes 1812, 1824, and 1853. Pop. ab. 30,000.

Shire. In England, a county.

Shiré. River of s.e. Africa, flowing from Lake Nyassa s. to the Zambesi. Length ab.370 m.

Shirlaw, WALTER, b.1838, N. A. 1888. Painter, b. in Scotland; active in New York since 1877, and prominent as an instructor; fine colorist and draughtsman.

Shirley, JAMES, 1596–1666. English dramatist and poet, now remembered chiefly for one or two lyrics. *The Traitor*, 1631; *The Gamester*, 1633; *The Example*, 1634; *The Lady of Pleasure*, 1635.

Shirley, WILLIAM, 1693–1771. Gov. of Mass. 1741–45 and 1753; Commander-in-chief 1755, Lieut.-gen. 1759.

Shirwa. Lake of s.e. Africa, s.e. of Lake Nyassa. Area ab. 350 sq. m., and dwindling.

Shishak. First king of the 22d Egyptian dynasty, 966 B.C.; conqueror of Palestine and much of Syria; spoiler of the temple at Jerusalem.

Shittim. Plain near Jericho, where the Israelites were led astray by Moabite wiles.

Shittim-Wood. That of *Acacia seyal;* used for the Hebrew tabernacle.

Shoa. S. part of Abyssinia, conquered by King Theodore ab. 1856; nominal Italian protectorate 1889–96. Capital is Lecheh, pop. 3,000. Area 15,000 sq. m., pop. 2,000,000.

Shoad Ore, or SHODE ORE. Fragments of ore broken from a main deposit and distributed irregularly over the surface by the action of natural causes. Shoading is a search for ore, guided by indications given by these fragments.

Shoals, ISLES OF. See ISLES OF SHOALS.

Shober, WILLIAM BUSH, Ph.D., b. 1864. American chemist, instructor in organic chemistry at Lehigh Univ. since 1892. Tr. *Practical Methods of Organic Chemistry*, by Gattermann, 1896.

Shock. Marked condition of depression occurring after an accident or an operation. Various explanations are given of its cause. A very satisfactory working hypothesis, in accident cases, is that it is an acute anæmia caused by loss of blood. Many lives have been saved after railway accidents by the use of emergency-cases as provided by some roads. The bleeding is sooner checked and the shock is usually less severe than in those cases where the means of prompt bandaging are not at hand.

Shock, WILLIAM HENRY, U.S.N., b.1821. Engineer of Farragut's fleet at Mobile 1863; Engineer-in-chief 1877–83.

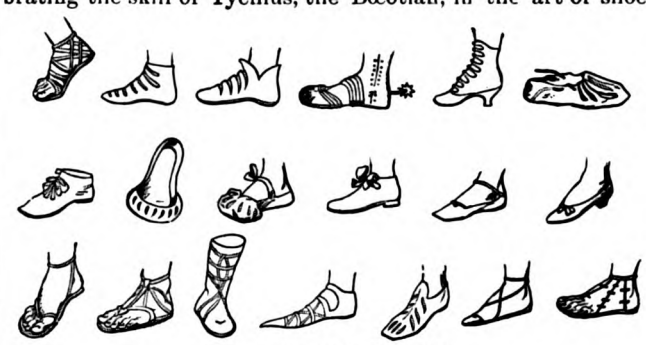
Shoddy. 1. Orig., waste wool; in commerce, cuttings, ground and mixed with fresh wool to make rugs, flannels, etc. 2. In 1861, worthless clothing furnished to the soldiers by dishonest contractors.

Shoe. See STAMP MILL.

Shoeburyness. Promontory in Essex, England, on the n. shore of the Thames. It is used by the government as a proving ground, and also as the seat of a school of gunnery.

Shoeing of Horses. See HORSESHOEING.

Shoes. Covering for the feet, made of leather in Europe, America and some other parts; of paper and various fabrics in China and Japan; of wood in Holland and France; of dressed skins among the N. American Indians. Shoemaking was practiced by the Egyptians in the time of Moses and illustrated in the tombs of Thebes. Homer, Ovid and Pliny agree in celebrating the skill of Tychius, the Bœotian, in the art of shoe-



Shoes worn at various times.

making, and the latter credits him with the invention of leather shoes. The Romans wore an ivory crescent on their shoes; and Caligula enriched his with precious stones. In England, ab. 1462, the people wore beaks or points on their shoes so long that they encumbered themselves in walking, and were forced to tie them up to their knees. The buckle was introduced 1688, and as at present worn ab.1633. Shoes are now largely made by machinery; a great variety of machines being used.

Shoes for Piles. Funnel-shaped irons for protecting the lower ends of wooden piles.

Shogun. Japanese military chief, practically supreme ab. 1200–1650.

Sholapur. Town of s. India, 150 m. s.e. of Poona. It has manufactures of cotton and silk. Pop., 1891, 63,312.

Sholes, CHRISTOPHER LATHAM, b.1819. Journalist at Milwaukee; inventor of the first typewriter, 1868.

Shoot. Stem of a plant, as distinguished from the root; also, more usually, young growing twigs or branches.

Shooting-Star. *Dodecatheon meadia.* Showy herb of the natural family *Primulaceæ*, with rose-colored flowers, native of the central U. S.; called American Cowslip.

Shooting Stars. See METEORS.

Shop Signs. The use of pictorial and emblematic signs dates from the period of general illiteracy. Among the surviving conventional signs are the barber's pole, representing the staff held by persons in venesection, the spirals being the two bandages; this dates from the time barbers were also surgeons. On the continent of Europe, a notched basin is more

common. The pawnbroker's three balls are said to be borrowed from the arms of the Medici. A bush hung without the door is still used by inns in parts of rural Europe. Tobacconists

The Sign of "The Running Footman."

cling to the old custom, with their images of Indians, etc. At one period, it was customary to give fanciful names to shops, as still to taverns, and carved emblems, such as the Golden Eagle, displayed.

Shore, JANE, ab. 1445–1527. Mistress of Edward IV., charged with sorcery by Richard III.; imprisoned in the Tower, and forced to do public penance.

Short, CHARLES, LL.D., 1821–1886. Pres. Kenyon Coll., Ohio, 1863; Prof. of Latin at Columbia Coll. from 1868; N. T. reviser 1871; editor of several text-books.

Short, CHARLES WILKINS, M.D., 1794–1863. Prof. Transylvania Univ. 1825, and Univ. of Louisville 1838–49; botanist.

Short, WILLIAM, 1759–1849. American envoy to France 1789, Holland 1792, and Spain 1794.

Shorthand. Known in some form to the Greeks; perhaps used by Xenophon in recording the sayings of Socrates. Galen (d.200) speaks of a copyist who could "write swiftly in signs." The Romans made much use of abbreviations. Ennius (d.169 B.C.) is said by Suetonius to have introduced and used signs (*notæ*); but Cicero's freedman and secretary, Tiro, is commonly credited with the invention of a system of rapid writing. Seneca (d.32) is said to have collected 5,000 different signs in use in his day. In England the system of T. Bright appeared 1588, that of P. Bales 1590. Some 80 different methods had appeared by 1850. Pitman's phonetic system was pub. 1837, and largely used; in the U. S., that of K. A. Bayley was the earliest, 1831. Lyndsey's Tachygraphy (including the vowels) dates from 1864. Graham's system, 1858, and Munson's, 1866, are founded on Pitman's.

Short-Horn. See CATTLE.

Shorthouse, JOHN HENRY, b.1834. English novelist, whose works display deep spiritual feeling and broad modern sympathies, with marked archaic and ecclesiastical tastes. His *John Inglesant*, 1881, grew out of long study of the 17th century. The others are brief: *Little Schoolmaster Mark*, 1883–84; *Sir Percival*, 1886; *A Teacher of the Violin*, 1888; *Countess Eve*, 1888; *Blanche, Lady Falaise*, 1891.

Shortsightedness. See MYOPY.

Shoshone Falls. On Snake River, in s. Idaho; ab.1,000 ft. wide and 1,000 high, with a sheer fall of 210 ft. Little Shoshone Falls, 4 m. e., are 182 ft. high.

Shoshones. Linguistic group of Indians, represented by tribes ranging from central Mexico n. almost to Canada. Among them were the Bannacks, Utes, Comanches, and Moquis. The S. proper (Snake Indians), related to the Pawnees, number less than 8,000, on reservations, mainly in w. Indian Territory. They practiced no agriculture, and have often been in want. They were enemies of the Texans, and in 1873 assisted the Modocs in their wars with the whites.

Shot. Solid projectiles, hollow projectiles, specifically classed as shell, and the minute projectiles used in fowling pieces. See CASE-SHOT and CHAIN-SHOT.

Shoulder Girdle. The three bones, scapula, clavicle and coracoid, which meet at the shoulder to support the arm or fore-leg. The coracoid is rudimentary in most Mammals, and the clavicle also in *Carnivora* and Rodents, and absent in Ungulates and *Cetaceæ*.

Shoulder Joint. Articulation of the bone of the arm with the shoulder blade. It is a ball and socket joint; the shallow socket being made deeper by projecting processes of the shoulder blade.

Shoup, FRANCIS ASBURY, 1834–1896. Brig.-gen. C.S.A. 1862–64; Prof. Univ. Miss. 1866, and at Sewanee, Tenn., 1883–88. *Artillery Drill*, 1864; *Algebra*, 1874.

Shovel, SIR CLOUDESLEY, R.N., ab.1650–1707. Knighted 1689; Rear-admiral 1690; distinguished at Bantry Bay, La Hogue, and Malaga; shipwrecked near the Scilly Isles.

Showers of Fishes. Instances of this kind have occurred in various places, but mostly in tropical countries. Sometimes the fish are alive, weighing from 1 to 3 lbs., and are usually the kind found in nearby waters. They are picked up from the water by the partial vacuum produced in the center of a whirling column of air, like that of a tornado. Showers of frogs and of pollen from pine-trees have also occurred. In U. S. the latter has been transported by upper air currents more than 100 m.

Shrapnel. See CASE-SHOT.

Shreve, HENRY MILLER, 1785–1854. Introducer of the first steamboat on the Mississippi 1815; inventor of improvements in steam vessels, of a snag-boat, and a marine battering ram; remover of obstructions in Red River.

Shreve, SAMUEL HENRY, 1829–1884. American civil engineer. *Bridges and Roofs*, 1873.

Shreveport. City of Caddo parish, n.w. La., on Red River, here navigable; chartered 1839; important shipping point for cotton. Pop., 1890, 11,979.

Shrews. Mouse-like *Insectivora*, with elongated muzzles; including many species living in woods and fens, feeding on small animals and nesting in the ground. Each female has 5 to 7 young in the spring. *Sorex* has well developed ears and

Pointed House Mouse (*Crocidura aranea*), Pointed Wood Mouse (*Sorex vulgaris*).

moderate tail; *Blarina* has short tail and small ears. The common European Shrew and the Mole Shrew are examples. *Neosorex*, the Marsh Shrew, has fringed toes. *Crossopus* is the European Water Shrew. See MACROSCELIDÆ AND SORICIDÆ.

Shrewsbury. Capital of Shropshire; on the Severn. Near S., July 21, 1403, Henry IV. defeated the nobles, led by Percy (Hotspur), who was slain. Pop., 1891, 26,967.

Shrikes (LANIIDÆ). Passerine birds with hawk-like bills, short rounded wings, and long tail. Ab. 100 species exist, mostly Old World forms; also known as BUTCHER-BIRDS (q.v.). *Lanius borealis*, the Northern Shrike, is bluish ash above, with rump and shoulders whitish, wings black, and wavy white and black below: it is distinguished from the Loggerhead Shrike in having the black bars on side of head, meeting in front. The Drongo Shrike, Cuckoo Shrike, etc., are birds of other families that resemble shrikes superficially.

Shrimp (CRANGON VULGARIS). Small, long-tailed crustacean much used for food in England and France; they are in season during the whole year, but the chief demand is in spring. In the U. S. they are eaten somewhat, but used chiefly for bait.

Shrine. Repository for the bones of saints and martyrs and other relics.

Shrouds. Range of large ropes extending from the mast-heads to right and left sides of a ship, to support the masts. —Also the dresses of the dead.

Shrovetide. Specifically the period between the Saturday evening before Quinquagesima Sunday and the morning of Ash Wednesday; often restricted to Shrove Tuesday.

Shrove Tuesday. Day before Ash Wednesday; on it R. Catholics are shriven or confessed. The Mardi Gras of the French, with its merry-making, is Shrove Tuesday. It is a popular festival at New Orleans.

Shrubs. Woody plants, branching from the ground; generally less than 25 ft. high.

Shubrick, WILLIAM BRANFORD, U.S.N., 1790–1874. Commander 1820, Captain 1831, Rear-admiral 1862.—His brothers, JOHN TEMPLAR, 1788–1815, EDWARD RUTLEDGE, 1794–1844, and IRVINE, 1798–1849, were also naval officers.

Shufeldt, ROBERT WILSON, U.S.N., 1822–1895. Consul-gen. at Havana 1861; Commander 1863, Captain 1869, Commodore 1876, Rear-admiral 1883.

Shuffle-Board. Old English game, long a common amusement in taverns; played by two or four persons with a set of iron weights of a lb. or less each, which are slid along a board some 30 ft. long and 20 in. wide. The board is covered with fine sand and has slightly raised edges to prevent the weights from sliding off. Ab. 5 in. from each end lines are drawn, which serve alternately as starting and finishing lines.

Shumagin Islands. Group of islands in lat. 55° N., long. 160° W., s.w. of the Alaska Peninsula, inhabited by seal hunters and fishermen. They were discovered in 1741 by Waxel. Coal is mined on one of the islands. Area ab. 600 sq. m.

Shumard, B. F., 1820–1869. Assistant geologist in the survey of Iowa, Wis., and Minn.; later under Profs. Swallow and Pumpelly in Mo.; State Geologist of Texas 1858.

Shunk, FRANCIS RAWN, 1788–1848. Gov. of Pa. from 1844.

Shunt. If in an electric circuit any two points be joined by an extra wire or conductor, a part of the current is deflected through this new channel, which is called a shunt. The application is very useful in reducing the strength of a current that is to pass through a galvanometer or other delicate instrument.

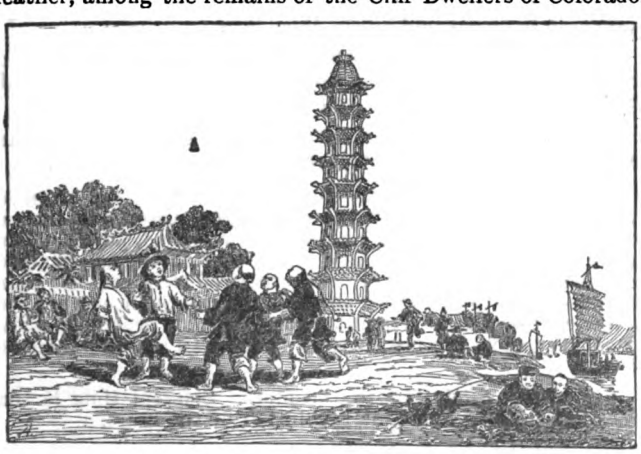
Shur. Name applied by the Hebrews to the desert bordering Egypt on the e. of the southern half of the Isthmus of Suez (Ex. xv. 22).

Shurtleff, NATHANIEL BRADSTREET, M.D., 1810–1874. Boston genealogist and antiquarian.

Shushan. Ancient capital of Persia. See SUSA.

Shute, SAMUEL, 1653–1742. Gov. of Mass. 1716–27; at odds with the general court, and in England from 1723.

Shuttlecock. Probably introduced as a plaything from the East, though found among the Zuni Indians of New Mexico as a familiar toy, and, made of corn cob, stuck with a feather, among the remains of the Cliff Dwellers of Colorado.



Playing Shuttlecock with the Feet, in China.

The Chinese variety is made of snake skin, weighted with a coin, has feathers inserted, and is kicked with the feet, as in Corea, and among the Pueblo Indians. A battledore is used in Japan and Europe. In Japan it is always made of the seeds of the soap-berry tree, and is played by girls on New Year's Day. See BATTLEDORE AND SHUTTLECOCK.

Shwan-Pan. ABACUS (q.v.) of the Chinese.

Sialagogues. Mercury, and other substances which increase the flow of saliva.

Sialkot. Town of n.w. India, 72 m. n. of Lahore. Its fort was defended against Sepoys 1857. Pop., 1891, 54,930.

Siam. Kingdom of Indo-China, between Burmah and Anam. It became known to the Portuguese 1511, and was explored by Mendez Pinto ab.1550. The Dutch traders gradually supplanted the Portuguese in the 17th century. Commerce with England was not much developed until the treaty of 1855; in 1856 the U. S. negotiated a similar treaty. The language indicates derivation from the same stock as the Hindus, in spite of the Mongolian type of features. The tradition is that the Siamese were freed from the Cambodian yoke in the 7th century, at which time many towns were founded, and they began to crowd the Cambodians toward the s. The Malay annals have it that they reached the end of the peninsula ab.1160. Ab.1340 they invaded Cambodia; the wars lasted some 400 years. In the 15th and 16th centuries, S. was often invaded by Burmese and Peguans, and in 1555 was reduced to dependence, from which it was soon delivered by a national hero. From 1592 to 1632 there was much intercourse with Japan. The present dynasty was founded by a successful general ab.1775. Some of her kings have been of quite different sort from the typical Oriental monarch, taking an enlightened interest in science and education. Area ab.250,000 sq. m., pop. ab.6,000,000.

Siam, GULF OF. Inlet in s. Asia from the China Sea, washing the shores of Siam, Cambodia, and French Cochin-China.

Siamang (HYLOBATES SYNDACTYLUS). Gibbon Ape of Sumatra, whose second and third toes are united as far as the outer joint.

Siamese. Chinese form nearly a third of the population of Siam; another third includes the Laos, who came originally from Thibet, and occupy the n. and mountainous portion. There are also Malays and less important tribes that suggest interesting ethnological questions. The Siamese proper are inferior to the Laos, who are proud, independent, intelligent, and tolerant. The Siamese in general are passionless, will sell their children into slavery for debt, love gambling and amusements, are submissive and hospitable but idle, and though Buddhists nominally, have many superstitions. They are inclined to agnosticism, and favor the introduction of European culture. In color they are between the Chinese and the Malays. Their chief occupation is agriculture, producing cotton, hemp, coffee and tobacco.

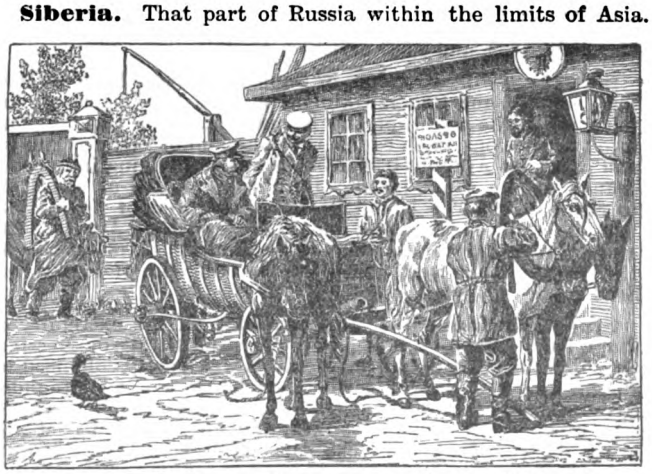
Siamese. Monosyllabic language of Farther India, subjected to strong Buddhistic influences in its linguistic forms and in its literature.

Siamese Twins. Chang and Eng (Left and Right), 1811–1874; connected at breast-bones; exhibited from 1829; settled in N. C., and married to sisters.

Sibbald, SIR ROBERT, 1641–1722. Scottish geographer, antiquary, and naturalist. *Scotia Illustrata*, 1684; *Autobiography*, 1837.

Sibbes, RICHARD, 1577–1635. English Puritan, whose works, collected in 7 vols. 1862–64, were once influential.

Siberia. That part of Russia within the limits of Asia.



Traveling in Siberia—Changing Horses at a Post-Station.

The surface is exceedingly varied. The s. part is made up of high plateaus and mountain ranges, the n. slopes of the great

mass of elevation of Asia. This elevated region extends n.e. along the borders of the Sea of Okotsk and Bering Sea, diminishing in height and in breadth. N. of this elevated country the level drops gradually to a great plain, the Steppes, which extend n. to the Arctic Sea, forming near the coast vast areas of frozen swamp or Tundra. The climate varies with the latitude and the elevation, and is everywhere marked by great extremes of heat and cold. S. is sparsely populated, mainly in the s. and w. Agriculture is the chief occupation. There is some cattle-raising, mining in a few localities, and a considerable trade. A railroad across the country is in process of construction. Area 4,826,287 sq. m.; pop., 1892, 4,539,000, mainly in the s. and w., but increasing rapidly of late, through voluntary immigration from Russia and deportation of criminals and political prisoners. The treatment of the latter has made S. notorious. Principal towns, Omsk, Irkutsk, and Tomsk.

Siberians. In n. Siberia the chief tribe is the Chukchee. They are nomadic fishers, but some possess reindeer. Both sexes dress alike, and usually go bareheaded. They are quick-tempered, abhor a natural death, and, when infirmity comes, voluntarily submit to be harpooned. There are ab. as many Russians in Siberia as aborigines, and in the e. part intermarriage has occurred extensively. See KAMCHATKA, OSTIAKS, TUNGUS, SAMOYEDS, MONGOLIANS, KALMUKS, HYPERBOREANS, TARTARS, and YAKUTS.

Sibilants. In Phonetics, letters uttered with the hissing of the voice, as *s*.

Sibley, HENRY HASTINGS, LL.D., b.1811. Pioneer settler of Minn.; M.C. 1849–53; Gov. 1858; commander against the Sioux, whom he defeated Sept. 1862; opposer of State railway bonds 1858, and of their repudiation 1871.—His father, SOLOMON, 1769–1846, was M.C. 1820–23, and Judge of Mich. Supreme Court till 1836.

Sibley, HENRY HOPKINS, 1816–1886. Officer U.S.A., distinguished in the Mexican war; inventor of the S. tent; Brig.-gen. C.S.A. 1861–65; in the Egyptian service 1869–74.—His father, GEORGE CHAMPLAIN, 1782–1863, was an explorer in the West and Indian commissioner.—Their cousin, HIRAM, 1807–1888, long pres. Western Union Telegraph Co., constructed a line to the Pacific 1861.

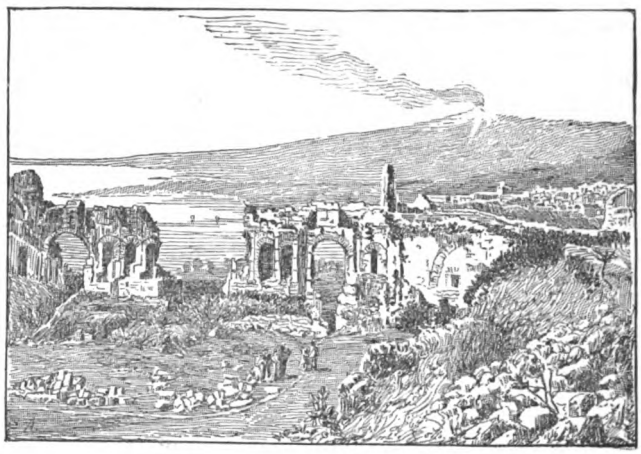
Sibthorp, JOHN, F.R.S., 1758–1796. Prof. of Botany at Oxford 1784. *Flora Oxoniensis*, 1794; *Flora Græca*, 20 vols., 1806–40.

Sibyl. Prophetess in ancient mythology, supposed to deliver inspired oracles. The number is first stated as one, but the sibyllæ afterward became localized, and later ten are designated. They are regarded as of Asiatic origin, and are said to have wandered with their sacred books from place to place. One of the most famous is the Cumæan sibyl, who, according to the legend, offered the Sibylline books to Tarquin. Her price being refused, she burned 3, and then 3 more, still demanding the original price, which the king at last paid. They were kept in the temple of Jupiter, consulted on emergencies, and burned with the temple 83 B.C. A later collection was destroyed in the 5th century. The later Sibylline Oracles are a collection of Greek verses, composed chiefly in the 2d and 3d centuries, apparently by Christians or Jews.

Sicilian Vespers. Massacre of the French (who acquired Sicily 1266) by the exasperated natives; it began at Palermo March 30, 1282, and 8,000 perished.

Sicilies, TWO. Kingdom of Naples and Sicily from ab.1130. The Norman and Suabian kingdoms passed to Charles of Anjou 1265. The revolt of the island, 1282, split the kingdom into two sections, each called the kingdom of Sicily. The island passed to Aragon (1296–1458), Naples remaining in another branch of the same house. Both were united as the T. S. to Spain 1504. The island passed to the Duke of Savoy 1713, was again united to Naples under Charles VI. of Austria 1720, and transmitted to the Neapolitan Bourbons 1738–1860. At the last date they were joined to the kingdom of Italy. See SICILY.

Sicily. Island in the Mediterranean, off the extremity of Italy, from which it is separated by the Strait of Messina. Originally held by Sicani or Siculi, it was partly colonized by Phœnicians 800 B.C. or earlier, and by Greeks, who founded Syracuse and other cities ab.750–579. A Carthaginian invasion was repelled at Himera 480 B.C., and an Athenian fleet and army destroyed at Syracuse 413. The island was mainly held by Rome from 241, and became a province 210 B.C. It was conquered by Vandals 440, recovered by Belisarius 535, and held by Saracens 827–ab.1080. It is noted for fertility, and notorious as the home of the Mafia. Length 185 m., greatest breadth 120 m., area 9,936 sq.m.; pop., 1890, 3,285,472. See SICILIES, TWO.



Ancient Greek Theater at Taormina, Sicily.

Sickel, HORATIO GATES, 1817–1890. Brigade commander 1861–65, serving chiefly in Va.

Sickingen, FRANZ VON, 1481–1523. German knight and warrior, protector of Reuchlin and Œcolampadius; associated with Von Hutten in an aggressive but futile campaign against the Abp. of Treves; besieged and killed at Landstuhl.

Sickle-Pod. *Arabis canadensis.* Woodland herb of the natural family *Cruciferæ*, with curved pods and small greenish-white flowers, native of e. N. America.

Sickles, DANIEL EDGAR, b.1823. M.C. 1857–61 and 1893–95; Brig.-gen. U. S. Vols. 1861; Major-gen. 1862–68; distinguished in the Va. battles and at Gettysburg; Col. U.S.A. 1866–69; Minister to Spain 1869–73; prominent in Democratic politics; sheriff of New York 1890.

Sickles' Cut-off. Form of valve-gear for steamboat engines, in which the stem of the STEAM POPPET-VALVE (q.v.) was released from its valve-rod (see STEVENS' VALVE-GEAR), so that the valve might close by gravity more quickly than it would if attached positively to a continuously moving gear. The descent should be retarded by a DASH-POT (q.v.). See also DROP CUT-OFF.

Sicula. Dagger-shaped spine, found at the proximal end of the polypary of a Graptolite, and representing the embryonic skeleton.

Sicyon. Ancient Greek city, 7 m. n.w. of Corinth; noted for bronze work and paintings. Apelles and Aratus were born here.

Siddhartha. See BUDDHA.

Siddim, VALE OF. Scene of a conflict recorded in Gen. xiv.; supposed to be covered by the Dead Sea.

Siddons, SARAH (KEMBLE), 1855–1831. English actress of highest rank, supreme in Shakespearean and other tragic parts 1782–1812; at Covent Garden Theater 1803–12.

Side Arms. Such as are worn at the side, as the bayonet and sword, but not the revolver or pistol.

Side-Lever Engine. Form for paddle-wheel ships of war; the head-links from the end of the piston rod, instead of passing upward to a single-beam overhead, passed downward to a double-beam, whose center was on the sole-plate of the engine. The pitman or connecting-rod rose from the beam or side-levers to the crank shaft above it. Such engines had a low center of gravity, and no part of them protruded above the deck exposed to hostile shot. See BEAM and BACK-ACTING ENGINE.

Sidereal. Relating to the stars. Sidereal time is that reckoned by the apparent revolution of the stars.

Sidereal Clock. See CLOCKS.

Sidereal Period of a Planet. Time required to perform a complete revolution as seen from the sun.

Siderite. $FeCO_3$. Native ferrous carbonate, commonly called spathic iron ore. It is a frequent mineral in veins of lead or silver ore; when found by itself in sufficient quantity and free from deleterious impurities, it is an important source

of iron. The iron in the clay iron stones is generally in this form. See IRON, METALLURGY OF.

Side-saddle Flower. See PITCHER PLANT.

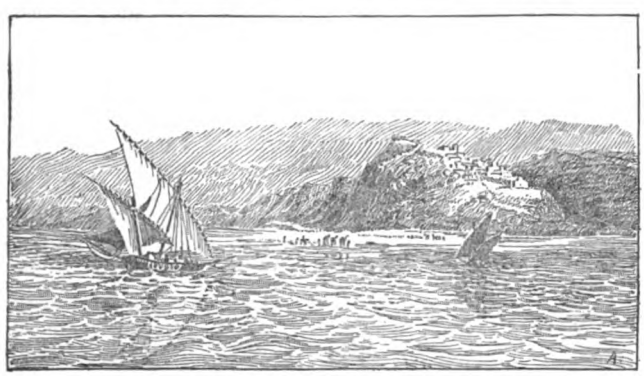
Sidgwick, HENRY, LL.D., D.C.L., b.1838. Prof. Cambridge 1883. *Methods of Ethics*, 1874; *Political Economy*, 1883; *Hist. Ethics*, 1886; *Politics*, 1891.

Sidmouth, HENRY ADDINGTON, VISCOUNT, 1757–1844. M.P. 1783; Speaker 1789–1801; Premier 1801–4; Viscount 1805; Privy Seal 1806–7; Home Sec. 1812–21; reactionary.

Sidney, or **Sydney,** ALGERNON, 1622–1683. Officer in Parliamentary army; Gov. of Dublin 1646; a judge at the trial of Charles I. 1648; member of Long Parliament, of Council of State, and Ambassador to Denmark 1659; in exile until 1677; charged with high treason (Rye House Plot) 1683, and beheaded Dec. 7. *Discourses concerning Government*, 1698.

Sidney, SIR PHILIP, 1554–1586. English poet and courtier, admired and remembered not more for his gifts and accomplishments than for the beauty of his character; knighted 1583; mortally wounded at Zutphen, fighting for Dutch liberty. His romance, *Arcadia*, *Defense of Poesy*, sonnets, psalm versions, and songs appeared posthumously, and were collected 1725.

Sidon. Long most powerful, and perhaps oldest, city of Phœnicia, on the coast ab. 22 m. n. of its colony, TYRE (q.v.),



Sarepta and Coast of Sidon.

by which it was eclipsed; famed for its maritime power and for the manufacture of glass: conquered by Cyrus ab.537 B.C.; taken from the pasha of Egypt by Turkey, aided by British ships, Sept. 1840.

Sidonius Apollinaris, ab.430–483. Son-in-law of the Emperor Avitus; Bp. of Clermont 472; author of panegyrics, epithalamiums, and letters.

Sidra, GULF OF. See SYRTIS.

Siebengebirge. Seven mountains in Rhenish Prussia on the right bank of the Rhine 20 m. above Cologne. The highest is Olberg, 1,522 ft., and the most famous DRACHENFELS (q.v.).

Siebold, PHILIPP FRANZ VON, 1796–1866. German botanist, in Japan 1823–30; Dutch Baron 1831. *Flora Japonica*, 1835–44. — His brother, KARL THEODOR ERNST, 1804–1885, prof. Munich 1853, wrote on natural history. *Invertebrata*, tr. 1857.

Siege. Operations of placing an army before a military position and attempting its capture by the method of regular approaches. Lines of circum- and counter- vallation are first established as a security against sorties from the besieged and attacks from the enemy's forces from without. After the investment is complete and depots are established the first parallel is constructed. This is a line of intrenchment of sufficient extent to embrace at least the capitals of the two salients adjacent to that of attack. At least three parallels are required, although there are instances of five or more having become necessary: the first should be beyond the destructive cannon range of the besieged, the second at the limit of the dangerous zone of small-arm fire, and the third where the full protection of the double sap is needed to protect the sappers from the direct front and slant fire of the infantry. Connecting the parallels and advancing upon the capitals are the zigzags or boyaux, by means of which the besiegers are enabled to gain ground toward the fortified place.

Siege Artillery. Pieces of heavier weight and greater caliber than those required for field service: designed to batter down the permanent defenses of a fortified place, and to destroy or dismount its armament. These are, in the U. S. service, 5-in. and 7-in. steel breech-loading rifles and 7-in. steel mortars, weighing 3,660, 3,710, and 1,715 lbs. respectively; the projectiles for them weigh 45, 105, and 125 lbs. respectively.

Siege Carriages. The 5-in. gun and 7-in. howitzer carriages are mounted on wheels and when united to their limbers form wheeled carriages. When in place the carriage is connected with platform by hydraulic buffers to check recoil. The mortar carriage is not wheeled; when in position it rests on three traverse circles to obtain the proper azimuth for firing, and its recoil is checked by hydraulic buffers and coiled springs inclosed in a strong case.

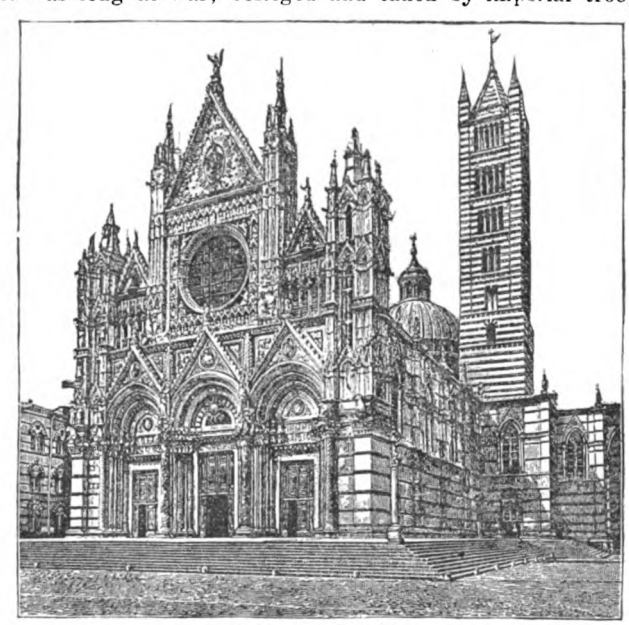
Siegfried. See NIBELUNGENLIED.

Siemens, SIR WILLIAM, F.R.S., 1823–1883. German engineer and electrician, in England from 1844. His greatest invention is the regenerative gas furnace, invented with his brother Friedrich 1857, and first successfully applied 1861. In 1862 he took up making steel by fusing malleable iron with cast-iron, and after several years perfected the Siemens' steel process. He was one of the earliest workers at the electric light, designed the steamer *Faraday*, which laid the first transatlantic cable, devised an electric furnace, an electric pyrometer, a direct process of making iron and steel from their ores, and a regenerative gas-burner.—His brother ERNST WERNER, 1816–1892, shared in several of his inventions.

Siena, GUIDO DA, 13th cent. Italian painter.

Sienkiewicz, HENRYK, b.1845. Polish novelist; ed. *Slowo*, 1880. *With Fire and Sword*, 1884, *The Deluge*, 1890, and *Pan Michael*, tr. 1894, form a long historical romance of great power. *Pisma*, 1880; *Without Dogma*, tr. 1894; *Quo Vadis*, tr. 1897.

Sienna. Old Tuscan city, 60 m. s. of Florence, with which it was long at war; besieged and taken by imperial troops



Cathedral at Sienna.

1555; held by Florence from 1557; once an important art center; noted for its duomo or cathedral. Its univ. was founded 1203. Pop. ab.28,000.

Sierra. Applied to a range of mountains in Spanish-speaking countries.

Sierra Leone. British colony on w. coast of Africa, w. of Liberia; area ab.15,000 sq. m. Along the shore the land is low and unhealthy, rising inland into hills. The rainfall reaches 170 in. annually. Pop., 1890, 75,000, including 224 whites, the balance negroes, one-half of whom are the descendants of liberated slaves.

Sierra Madre. Mountain range of w. Mexico, extending from the U. S. border to Guadalaxara, ab.300 m.; height seldom over 10,000 ft.

Sierra Morena. Mountain range of s. Spain, separating the basins of the rivers Guadiana and Guadalquivir. The highest summit, Aracena, is ab. 5,500 ft. above sea.

Sierra Nevada. 1. Range of s. Spain, s. of the Guadal-

quivir; greatest altitude 11,660 ft. 2. Principal range of Cal. It extends along most of the e. border, with long spurs descending w. to the valley of Cal., and a short precipitous descent e. Its height increases s., and reaches its maximum in Mt. Whitney, near its s. end, 14,898 ft.

Sieve-Cells. Elongated cells of the fibro-vascular system of plants, characterized by their walls being finely perforated in certain well-defined panels or plates, called sieve-plates; also known as cribrose-cells and sieve-tubes.

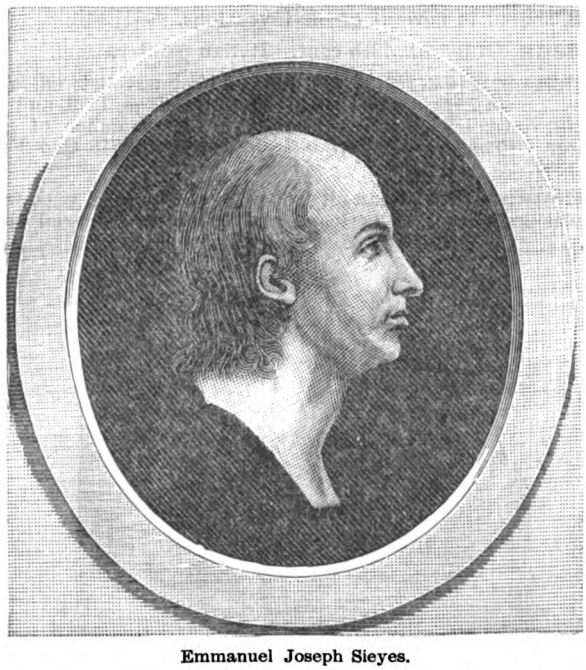
Sieveking, AMALIE, 1794–1859. Founder of a nursing sisterhood at Hamburg 1832, nucleus and model of others throughout Germany.

Sievers, EDUARD, b. 1850. Prof. Jena 1876, Tübingen 1883, Halle 1887, and Leipzig 1892; prolific writer on philology. *Anglo-Saxon Grammar*, 1881, tr. 1887.

Sievershausen. Near Hanover; scene of a defeat of Albert of Culmbach, 1553, by the imperial troops under Maurice of Saxony, who was slain.

Sieve-Tubes. See SIEVE-CELLS.

Sieyès, EMMANUEL JOSEPH, 1748–1836. French priest, who, by pamphlets on human rights and the Third Estate, 1788–89, profoundly influenced the early course of the Revolution; Deputy 1789; one of the Directory 1799, and of the three Consuls,



Emmanuel Joseph Sieyes.

having planned the movement of 18th Brumaire with Bonaparte, who made him a count. Thinker rather than politician, the servant of fixed ideas, he bore no part in the Reign of Terror, lived in retirement under Napoleon, and was in exile 1815–30.

Sigel, FRANZ, b. 1824. Leader in German insurrections 1848–49; in America from 1852; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862–65; prominent in Mo. and Va.; journalist, lecturer, and official in New York since 1867.

Sighing. Deep and long-drawn inspiration chiefly through the nose, followed by a somewhat shorter, but correspondingly large, and audible expiration; it is manifested frequently during profound mental impressions, as of grief.

Sight. SENSATIONS OF. Changes of consciousness aroused by stimulation of the retina of the eye; of two distinct kinds, sensations of light, supposed to be due to rapid vibrations of luminous ether, and of color, due to differences in rapidity of vibration. Sight is probably the most presentative of all the senses by which we acquire direct knowledge of the external world. See EYE, AFTER IMAGES, COLOR, COLOR-BLINDNESS, DOUBLE IMAGES, and HOROPTER.

Sights. Attachments used for pointing a gun. The front sight is a fixed point, a thin edge, or cross wires in a protecting tube; the rear sight consists of a rod, bar or standard, graduated in degrees or ranges, fixed in a socket on the breech of the gun corresponding in position with the front sight. It carries a sliding notch or small aperture which can be adjusted to any height corresponding to a given range or elevation: the notch has also a motion at right angles to the rod to correct for drift, wind velocity, or other causes of lateral deflection. The sights used in small arms consist of a fixed point of metal for the front sight and a graduated metal leaf carrying a notch arranged for adjustment for all ranges.

Sigillaria. Genus of extinct LEPIDODENDREÆ (q.v.).

Sigillum Confessionis. Seal of confession. In R. C. Ch., the obligation of a confessor not to divulge the secrets of the confessional.

Sigismund, 1368–1437. German emperor from 1411; son of Charles IV.; King of Hungary 1387; defeated at Nicopolis, by the Turks, 1396; imprisoned by the usurper Ladislaus of Naples, 1401–3. He convoked the Council of Constance 1414; consented to the condemnation of Huss, in violation of his own safe-conduct; sold Brandenburg to Frederic of Zollern, and defeated the Turks, 1416 and 1419. His succession to the Bohemian throne, 1419, was successfully resisted by the HUSSITES (q.v.), but obtained 1436, by concessions to the Calixtines, which he afterward withdrew. His death averted civil war. He did little for the empire.

Sigismund I., 1466–1548. King of Poland from 1507; able and prosperous ruler, patron of letters and of the Reformation.—II. (AUGUSTUS), 1520–1572, his son and worthy successor.—III., 1566–1632; his nephew, King of Poland 1587, and of Sweden 1592–1604. His reign was warlike and injurious.

Sigmaringen. See HOHENZOLLERN.

Sigmoid. In Botany and Geology, S-shaped structures.

Signay, JOSEPH, D.D., 1778–1850. Bp. of Quebec 1833; Abp. of the province 1844.

Sign. Symbol of operation, direction, character, relation, as distinguished from symbols of quantity or mere abbreviations.

Signal Code. Signals by means of which messages may be sent in the presence of the enemy without being intelligible to them. The code is usually based upon a small number of elementary signals; that of the army is one of three elements, a motion to the right, one to the left, and a forward motion. The first two signals, designated 1 and 2, may by combination give all the letters of the alphabet and the third designate the completion of a word or sentence. The code may be transmitted by flags, torches, semaphores or telegraph. The signals are interpreted by a signal book.

Signal Service. Organization for display of signals for any purpose; especially, meteorological branch of office of Chief Signal Officer U.S.A., the military duties of which were imposed on it 1862: the meteorological work was added in February 1870. The chief is by law a brig.-gen. The chiefs have been: A. J. Meyer 1862–80; Wm. B. Hazen 1880–87; A. W. Greely, since 1887. The meteorologists have been: Wm. Ferrel, 1881–87, Cleveland Abbé, since 1871. By act of Congress all the meteorological duties of this service were July 1, 1891, transferred to the new weather bureau of the Department of Agriculture.

Signature. In Printing, the figure or letter at the lower part of the first page of a sheet, intended to facilitate the gathering of the sheets for binding them.—Also the sheet when folded ready to gather.

Signature of Plants. In early medicine, a belief that the external formation or color of plants indicated that they were adapted for particular diseases; as Lungwort and Liverwort.

Sign Boards. House signs were indispensable in city life when few could read and write. As education spread, they were less needed, and when the system of numbering houses was introduced in the last century, their original value lingered on, usually as business advertisements. Sign boards appear to have been adopted from the Romans, examples of whose pictorial signs have been excavated at Herculaneum. See SHOP SIGNS.

Signet. In England, the king's seal, used in sealing his private letters, and all such grants as pass his majesty's hand by bill signed.

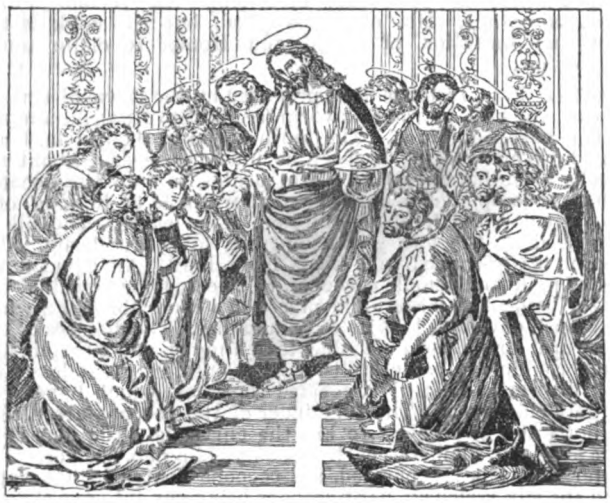
Significant Figures. In Arithmetic, those having quantitative value; distinguished from zero and other symbols of position in the scale.

Sign Language. See DEAF MUTES.

Sign Manual, ROYAL. The signature or subscription of the king or queen is termed the sign manual. This is done

as a personal act of the sovereign, but when the great seal is employed it is an act of state.

Signorelli, LUCA, ab.1441–1523. Tuscan painter, enthusiastic student of the nude form, and predecessor of Michelangelo. He has frescoes at Orvieto and in the Sistine



Communion of the Apostles—Cathedral of Cortona, by Signorelli.

chapel. His great work is the series of frescoes in the chapel of the cathedral of Orvieto painted after 1499. In painting them he was assisted by his pupil Girolamo Genga.

Sigourney, LYDIA HOWARD (HUNTLEY), 1791–1865. American poet, once very popular. *Letters of Life*, 1866.

Siguenza y Gongora, CARLOS, 1645–1700. Mexican author.

Sigwart, CHRISTOPH VON, Ph.D., b.1830. Prof. Tübingen 1863. *Logic*, 1873–78, tr. 1894.

Sikes, WILLIAM WIRT, 1836–1883. U. S. Consul at Cardiff from 1876; journalist and author.—His wife, OLIVE (LOGAN), b.1841, m. 1871, is an actress and writer.

Sikhs. Sect in India, rejecting idolatry and caste distinctions, and infusing much of Buddhism and Mohammedanism into Hinduism; founded by Nanak, a Hindu, 1469–1538. They became a great military power in the 18th century; but submitted to the English 1848, when the Punjab was annexed to the British empire, and furnish ab. 14,000 soldiers to the British army.

Silage. Fodder material preserved in the fresh state in a silo by the process of ENSILAGE (q.v.). It usually takes also the name of the fodder so preserved: *e.g.*, corn silage, clover silage. The former is the best silage plant in America.

Silenus. Satyr, companion and instructor of Bacchus; gifted with the power of prophecy; represented as a fat, bald, jovial, old man, intoxicated, and often riding on an ass.

Silesia. S.e. province of Prussia; early occupied by German tribes, succeeded, as they moved w., by Slavs; joined, successively, to Moravia, Bohemia, and Poland; separated from Poland 1163, but ruled by dukes of the Piast line, who encouraged German colonies; then held by Bohemia, and thus connected with Germany. An agreement of succession, made 1587, made Prussia heir to parts of it; but Austria seized them as a lapsed fief of Bohemia, the remaining portions having previously fallen to her. This claim was resisted by Frederick II., and after the SEVEN YEARS' WAR (q.v.), Silesia was ceded, 1763, to Prussia. Capital Breslau. Area 15,557 sq. m.; pop., 1890, 4,224,458.

Silesia, AUSTRIAN. Duchy and crown-land in the n.e. of Moravia; province of Austrian empire. Area 1,987 sq. m.; pop., 1890, 602,117.

Silesius, ANGELUS. See SCHEFFLER, J.

Silex. See SILICA.

Silhouette. Profile drawn in black, the shadows and extreme depths being indicated by the heightening effect of gum or some other shining material; named from Étienne de Silhouette, 1709–1767, French Minister of Finance 1759, and noted

Silhouette Portraits.

for reforms in the interest of economy. Silhouettes were known to the ancients, as is shown on vases.

Silica. SiO_2. Chemical compound consisting of silicon and oxygen, occurring in nature by itself in the three forms of quartz, opal, and tridymite, and in combination with various bases in the class of minerals known as silicates; made by melting sand with sodium carbonate, and treating with hydrochloric acid; insoluble in water and the ordinary acids, soluble in alkalies and hydrofluoric acid; fusible with difficulty; found in plants, straw, and eggs; used extensively in the manufacture of glass and porcelain.

Silicate Cotton. This was first made by a steam-blast on a stream of melted slag; invented by John Player, of England, as made at the present. Owing to sulphur in furnace slags, which when wetted would corrode iron, rocks are fused and treated in the same manner, 4 parts of orthoclase with 6 parts of dolomite. It is usually white, and is used as a non-conductor to prevent freezing of water pipes, cooling of steam pipes and dampness in buildings, to keep out vermin, and to prevent the spread of fire, it being non-combustible. It came into general use 1871. It occurs in nature as PELE'S HAIR (q.v.).

Silicates. Derivatives of silicic or of the polysilicic acids; family of minerals, numbering several hundred species, consisting of silicon and oxygen, combined in many different proportions with aluminium, calcium, magnesium, sodium, potassium, iron, and many other chemical elements. Except sandstones and limestones, almost all the common rocks are made up to a large extent of silicates.

Silicic Acids. These are numerous. All may be regarded as derived from normal silicic acid, $Si(OH)_4$. The simplest form is H_2SiO_3, made by decomposing a silicate in solution with dilute hydrochloric acid. When the solution is evaporated to dryness, the residue is no longer soluble. Disilicic acid, $H_2Si_2O_5$, is derived from two molecules of the ordinary form by abstracting one molecule of water; trisilicic acid, $H_4Si_3O_{10}$, from three molecules of the ordinary acid by abstracting two molecules of water. Other trisilicic acids are derived in a similar way. Many minerals are derivatives of some form of silicic acid.

Silicide of Carbon. See CARBORUNDUM.

Silicified Wood. Wood in which the organic matter has been removed and its place taken by silica, usually in the form of agate (agatized wood), or of opal. Tree trunks, three or four feet in diameter or more, have been found in considerable quantity in the silicified condition in Arizona and elsewhere. When polished, these masses exhibit a beautiful variety of colors. See PETRIFIED WOOD.

Silicle. Short form of the fruit called a silique, found in Peppergrass, Shepherd's Purse, and other plants of the Mustard family.

Silicon. Si. At.wt. 28.4, sp. gr. 2.49, sp. ht. .167, Valence IV.; discovered by Berzelius 1823. Next to oxygen it is the

chief constituent of the earth's crust, probably one-fourth. It occurs in crystallized and amorphous forms. The former may be made by fusing potassium fluosilicate with sodium and zinc. As a brown amorphous powder, it is obtained by passing the vapor of silicon tetrachloride over heated sodium. Amorphous silicon is not dissolved by sulphuric or nitric acids, but is readily soluble in hydrofluoric acid and potassium hydroxide.

Silicon Bromoform. $SiHBr_3$. Colorless liquid, spontaneously inflammable in the air; bpt. 115°–117° C.; sp. gr. 2.7; formed by treating silicon chloroform with hydrobromic acid; analogous to bromoform, $CHBr_3$.

Silicon Carbide. SiC. Transparent, rhombic tablets, of brilliant luster, not soluble in the common acids; decomposed by fusion with caustic alkalies; hardness 9.5, sp. gr. 3.22; made by treating silica with carbon at a temperature of ab. 3,500° C.; used for polishing purposes and for the manufacture of polishing apparatus. See CARBORUNDUM.

Silicon Chloroform. $SiHCl_3$. Colorless, mobile, fuming liquid of a strong odor, very inflammable and unstable; so called on account of its compositional resemblance to chloroform.

Silicon Hexabromide. Si_2Br_6. Liquid boiling at 240° C. It forms a white substance with water, and is made by the action of bromine upon silicon hexiodide dissolved in carbon disulphide.

Silicon Hexachloride. Si_2Cl_6. Colorless, mobile, fuming liquid; bpt. 146°–148° C. It solidifies at 14° to large white leaf-like crystals. It is made by passing the tetrachloride over fused silicon.

Silicon Hexiodide. Si_2I_6. Colorless, doubly refracting prisms or rhombohedra; mpt. 250° C. (in vacuum); made by heating the tetraiodide with finely divided silver to 290°–300° C.

Silicon Hydride. SiH_4. Colorless gas, made by treating a compound of magnesium and silicon with hydrochloric acid. Prepared in this way, it takes fire in the air.

Silicon Iodoform. $SiHI_3$. Colorless, strongly refractive liquid; bpt. 220° C., sp. gr. 3.36; made by passing hydriodic acid gas over heated silicon.

Silicon Tetrabromide. $SiBr_4$. Colorless, fuming liquid; bpt. 149° C., sp. gr. 2.81; made by heating the elements together.

Silicon Tetrachloride. $SiCl_4$. Acrid, fuming, colorless liquid, made by passing chlorine over a strongly heated mixture of silica and charcoal; decomposed by water.

Silicon Tetrafluoride. SiF_4. Strongly fuming, colorless gas of a pungent odor, made by treating calcium fluoride and silica with sulphuric acid.

Silicon Tetraiodide. SiI_4. Colorless, transparent, regular octahedra, isomorphous with carbon tetraiodide; mpt. 120.5° C., bpt. 290° C.; made by passing iodine vapors over heated silicon.

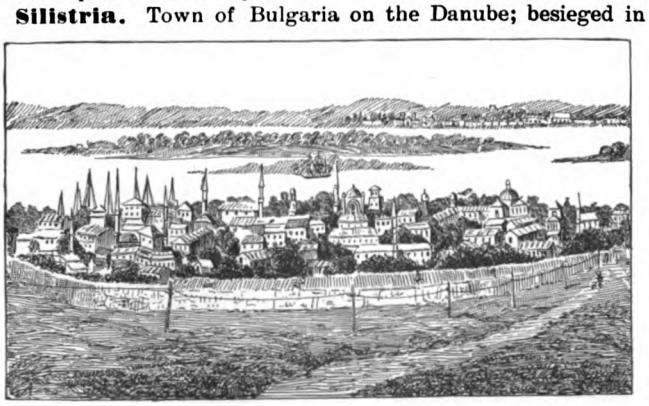
Silicoskeleta. Sub-class of *Radiolaria*, including the orders PERIPYLÆA, MONOPYLÆA, and PHÆODARIA (q.v.).

Siliculosa. Order of the Linnæan class *Tetradynamia*, including those cruciferous plants which bear short round pods called silicles.

Silique. Two-valved, capsular fruit, each valve having a parietal placenta, from which the valves break away when mature, as in many plants of the Mustard family.

Siliquosæ. Order of the Linnæan class *Tetradynamia*, including those cruciferous plants which bear elongated, slender pods called siliques.

Silistria. Town of Bulgaria on the Danube; besieged in



Silistria.

vain by the Russians 1773 and 1810; taken by them June 30, 1829, but restored to the Turks later; besieged again by 30,000 Russians 1854 and many times assaulted in vain. June 15th the garrison assumed the offensive, crossed the river, defeated the Russians, destroyed the siege works, and raised the siege. Its principal redoubt was ordered to be destroyed by the Congress of Berlin, 1878. Pop., 1893, 11,710.

Silius Italicus, 25–101. Latin epic poet, Consul 69. His *Punica*, in 17 books, describing the second Punic war, is extant. His meter is good, but the work is too close an imitation of Virgil and Homer to claim much originality.

Silk. Fine, lustrous fiber produced by the larvæ of certain moths, the best by the Silkworm (see BOMBYCINA), an annual, and a native of China. The moth is white, about 1 in. long, and lays many eggs, as large as mustard seeds. About six weeks after hatching the worm begins to spin the cocoon, which is completed in a week. The worm is 3½ in. long, of a cream color, and feeds on white-mulberry leaves. The silk is produced by the two glands opening in the underlip. The cocoon is egg-shaped, and about 1¼ in. long. An equal number of male and female cocoons are selected for breeding, the latter being the larger, and placed in a room ab. 70° F., when the moth develops, lays its eggs, and dies. The diseases of the silkworm are muscadine, due to a fungus, and pebrine and flacherie, due to bacteria; they have entailed great losses on silk growers. Pasteur suggested remedies, which have been largely efficacious. The remainder of the cocoons are placed in hot water or an oven to kill the chrysalis. The fiber is as fine as $\frac{1}{400}$ in. diameter, each cocoon yielding ab. 300 yds. The outer floss silk is separated, the cocoons floated in hot water and the silk reeled off, 2 to 6 cocoons being run into one thread. The cocoons yield ab. 10 per cent of raw silk. The raw silk contains up to 25 per cent of gum, which is removed by boiling with soap. The silk is used in the raw and in the boiled state, several threads being twisted into one. It is dyed in the thread, or in the piece after weaving. The fabrics are often loaded with tannic acid and metallic salts in the dyeing to increase their weight. The world's annual production of raw silk is estimated at 30,000,000 lbs., China and Japan furnishing one-half, Italy one-third, and France, the Levant and India the balance. The annual silk manufactures of the world are valued at $320,000,000, of which $120,000,000 are by France, $80,000,000 by the U. S., Switzerland and Germany each $20,000,000, and England $5,000,000; Japan also largely manufactures. In 1896 there was imported into the U. S. silk manufactures valued at $26,652,768, and unmanufactured silk valued at $26,753,428. The price of raw silk in New York, Jan. 1898, was from $2.25 to $4.50 per lb. Good silk, rated as No. 1, was from $3.50 for Japanese to $3.90 for Piedmont, Italian.

Silk. In Botany, long styles of the flowers in an ear of maize.

Silk-Cotton Trees. Of the Mallow family, of the genera *Bombax*, *Pachira* and *Eriodendron*, natives of tropical Asia and America, bearing very large flowers and seeds provided with long, silky hairs.

Silkweed. See MILKWEED.

Silkworm. See BOMBYCINA.

Silkworm Gut. Material prepared in Italy and Sicily, and used by anglers for dressing the hook end of a fishing line. The worms, about to begin spinning, are immersed in vinegar for ab. 12 hours, when they are pulled apart, exposing two transparent yellowish-green cords, which are stretched on a board to dry.

Sill. In Mining, horizontal piece of timber laid to support the vertical or inclined legs of a set of timbers.

Sill, EDWARD ROWLAND, 1841–1887. Prof. Univ. Cal. 1874–82; poet.

Sill, JOSHUA WOODROW, U.S.A., 1831–1862. Brig.-gen. U. S. Vols.; killed at Murfreesboro.

Sillery. Village near Rheims, France, famous for its champagne. Pop. 400.

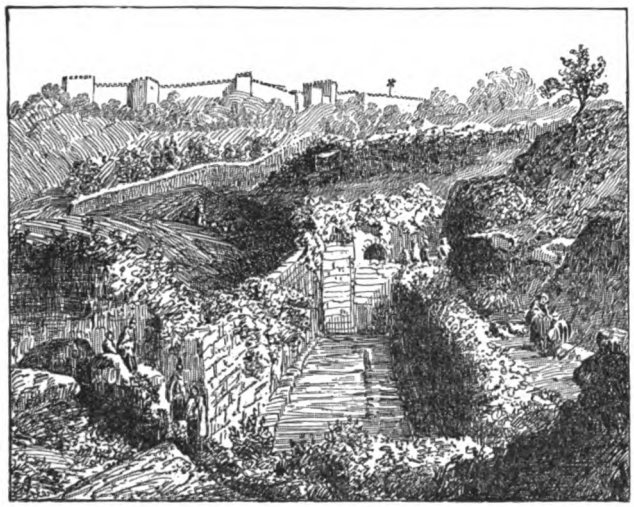
Silliman, BENJAMIN, M.D., LL.D., 1779–1864. Prof. of Chemistry at Yale 1802–53; founder of its museum of geology, and of the *American Journal of Science and Arts*, 1818; eminent as a physicist and geologist. *Chemistry*, 1830.—His son, BENJAMIN, M.D., LL.D., 1816–1885, was Prof. Yale from 1846, co-editor *Journal of Science* from 1845, and author of several text-books and many monographs.

Sillimanite. Al_2SiO_5. Aluminium silicate, commonly found as an accessory ingredient in several kinds of metamorphic rock; also called fibrolite.

Silo. See ENSILAGE and SILAGE.

Siloam. Fountain and pool of Jerusalem, connecting with a second pool by an aqueduct, mentioned in O. T. and

N. T. It is intermittent. Here in 1880 a Hebrew inscription was found, dating from ab.700 B.C., describing the making of



Pool of Siloam.

a tunnel from a spring to the pool. In 1889 a second conduit was discovered 20 ft. below the ground.

Silt. Fine, impalpable mud collecting in lakes and estuaries; often all calm and gradual deposits of mud, clay, or fine sand.

Silures. Ancient people, probably of a non-Aryan stock, being dark and curly-haired, inhabiting the s.e. of South Wales. They were warlike and resisted fiercely the Roman generals who invaded their territory.

Silurian. Series or system of fossiliferous rocks lying immediately below the Devonian; first studied in Wales by Murchison, who named them from the Silures, an ancient British tribe. This term has been gradually restricted, and is now applied only to Murchison's upper division, the lower being called Ordovician. See COLUMN.

New York.	Britain.	Bohemia.	Sweden.
Lower Helderberg	Ludlow	Étage E, F, G, H.	VII, VIII Region DE and E
Onondaga			
Niagara	Wenlock		
Clinton } Medina }	Llandovery (with May-hill Sandstone)		
Oneida			

Siluridæ. See NEMATOGNATHI.

Silva, ANTONIO JOSÉ DA, 1705–1739. Portuguese dramatist, b. in Brazil; burned at Lisbon, with his mother and wife, as Jews.

Silva, JOSÉ LAURENCIO, 1792–1873. Venezuelan officer, prominent in the liberation of Colombia and Peru; Major-gen. 1828; exiled 1831–35; Lieut.-gen. and Sec. of War 1855.

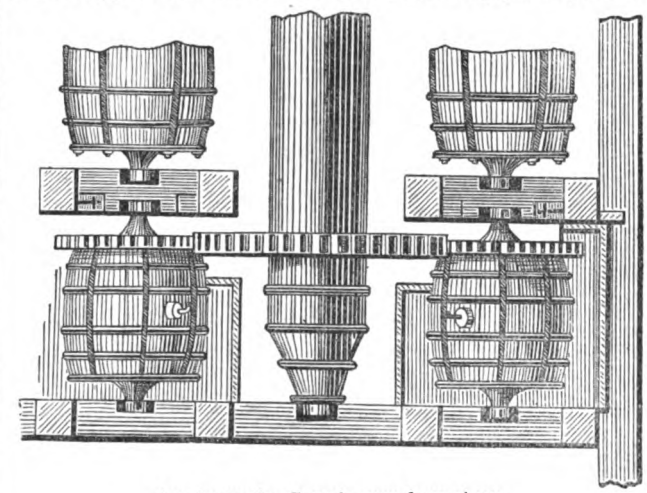
Silva Lisboa, JOSÉ DA, 1756–1835. Brazilian historian and statesman, Senator 1826.—His brother, BALTHAZAR, 1761–1840, pub. *Annals of Rio Janeiro*, 7 vols., 1834.

Silver (ARGENTUM). Ag. At.wt. 107.92, sp. gr. 10.5, sp. ht. .057, mpt. 954° C., valence I. It unites directly with the halogens, forming insoluble compounds. Treated with hydrochloric acid, it becomes covered with a layer of the insoluble chloride. It is soluble in concentrated sulphuric acid; the best solvent is nitric acid. It is used for coins and silverware. Its salts, which are affected by light, are used in photography.

Silver, METALLURGY OF. Silver occurs most abundantly in the following ores: Native silver, Argentite, Pyrargyrite, Proustite, and Cerargyrite. Besides these there are several other ores with sulphur, arsenic, bromine, etc.; and it is also found in small amount in the ores of other metals, notably in tetrahedrite. Pure silver is white, soft, very malleable, very ductile, the best known conductor of heat and electricity. Its mpt. is 954° C.; it boils below the mpt. of platinum (1,775° C.), and has been distilled; its vapor is greenish. Thin leaf is blue by transmitted light. It crystallizes usually in octahedrons. When melted, it absorbs 22 times its volume of oxygen, which it gives out suddenly when setting, producing a spitting. It does not oxidize in dry or damp air, but is easily blackened by vapors containing sulphur, forming silver sulphide. It alloys easily with melted lead, copper, zinc, and many other metals; it dissolves in cold mercury, more easily in hot.

Three principal methods are used in treating the ores. The most usual is to smelt the silver ore together with lead ore, the lead obtained carrying all the silver. This may be accomplished in any of the ways used for treating lead ores (see LEAD, METALLURGY OF). This silver-bearing lead can be desilverized by several processes. Another method is to convert the silver into chloride, then dissolve this in a salt solution, from which it is afterward precipitated. Another is to amalgamate the silver by grinding the ore up with mercury, and distilling the mercury from the amalgam.

Amalgamation processes are very old, and are conducted as follows: the barrel amalgamation makes use of tight, revolving barrels. If the ore is not native silver or the chloride, it is first roasted with common salt, which converts the silver into chloride. The charge of a barrel, in Freiberg, was 1,500 lbs. of roasted ore, 300 lbs. of water, 120 lbs. of lumps of iron. The barrel was turned 12 times a minute for 2 hours, then stopped, and 300 to 500 lbs. of mercury put in, and ro-



Amalgamating Barrels, seen from above.

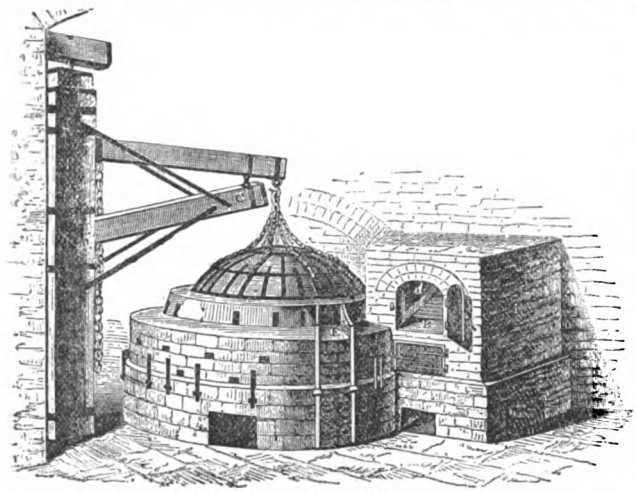
tated again 20 times a minute for 18 hours. The barrel was then filled two-thirds full of water and turned two hours longer. The amalgam thus obtained was squeezed through canvas bags, and the pasty, rich amalgam put into retorts in which the mercury was distilled off, leaving nearly pure silver. The cost of treating an ore by this method is $10 to $20 per ton, making it profitable to treat only ores over 25 to 50 ounces of silver per ton.

The same process can be conducted more economically in iron pans, in which the finely-divided ore is ground with hot water and mercury. This is called the Washoe process, and can be operated for $5 to $7 per ton. The same principle is again employed in the more primitive Patio process, in which the preliminary grinding of the ore is done in an ARRASTRA (q.v.), and the amalgamation is done by spreading the fine ore on a cemented or paved courtyard, making a mud of it, sprinkling it over with salt, and then treading it by driving mules through. After the salt is worked in, mercury and some sulphate of iron and copper are added, and trodden in. The whole working of a heap takes 15 to 45 days. The mass is then washed in tanks, the amalgam separated, squeezed through canvas bags, and distilled. This process was largely used in Mexico and Spanish-American countries from 1600 nearly to the present.

The wet processes of silver extraction depend on the fact that silver chloride, while not soluble in water, is soluble in solutions of common salt, sodium hyposulphite, copper hyposulphite, etc. If the ore is a chloride, bromide, or iodide ore, it can be treated directly. If not, it is first roasted carefully with common salt, an operation called chloridizing roasting, whereby silver chloride is formed. The ore containing the silver as chloride is then placed in tanks having false or perforated bottoms, and is washed with a strong brine (Augustin's process), or sodium hyposulphite (Patera), or calcium thiosulphate (Kiss), or hyposulphite of sodium and copper (Russell). All these solutions dissolve notable quantities of silver chloride, and are mostly precipitated by putting into them strips of copper, which throws down pure silver. Russel's process can be applied to most silver ores without preliminary chloridizing roasting, and he prefers to precipitate the silver as sulphide by adding sodium sulphide. The precipitated silver sulphide is filtered out, dried, and gently roasted in air to silver. These wet processes are in extensive use, and can treat very poor ores.

The concentration of silver in lead furnishes work-lead, which must be desilverized. The oldest method of accom-

plishing this is cupellation. The lead is placed upon a hearth of baked bone-ashes or marl, and heated to redness with access of air. The lead and any other base metals present oxidize, and the oxides thus formed, being liquid, are absorbed by the porous bed, until finally only pure, unoxidizable silver



German Cupelling Furnace.

remains. The furnaces for this operation frequently had a removable roof, as in figure. As at present conducted, this final cupellation is always preceded by a refining process, in which the lead is oxidized but is not absorbed by the hearth; a little notch in the side of the furnace allowing the melted oxides continually to flow from the furnace.

Another means of desilverizing lead is Parkes' process of stirring into it, at a red-heat, metallic zinc, and then letting the bath stand. The zinc, rising to the surface, brings all the silver with it as a rich alloy, while the remaining lead contains only a little zinc, and needs only to be heated a few hours in a softening furnace to be very pure. The zinc alloy is skimmed off, and heated in closed retorts provided with a condenser to catch the zinc vapors driven off. Sometimes the zinc vapors are not condensed, but allowed to burn directly to zinc oxide, which is caught in bags and used for paint. The silver in the retort is nearly pure. The use of a little aluminium in working Parkes' process is very advantageous, as it prevents oxidation of the zinc in the pot and produces richer scums. The scums are treated in Germany quite satisfactorily by electrolysis, producing a very pure electrolytic zinc and leaving rich silver residues.

In treating argentiferous copper ores, the silver accumulates in the copper-iron sulphide or matte, and is extracted by Ziervogels' process of roasting this very carefully, converting the silver almost entirely into sulphate, soluble in water, and washing it out. The silver solution is then precipitated, as by copper.

It is one of the most widely distributed of the metals, and has been known to man since remote antiquity. At different times, different regions have taken the lead in production. The mines of Saxony, Bohemia, and the Harz Mts. have been worked for centuries, and those of Mexico have long been celebrated for their richness. In S. America, Peru, Bolivia and Chili have been the largest producers In the U. S., prior to 1860, the amount produced was small; but during the next thirty years, the yield rapidly increased, amounting in 1892 to 63,500,000 oz., or two-fifths of the world's total production in that year. Since 1892 the amount annually produced has materially fallen.

The world's production of silver was, in 1895, 169,180,249 oz. Of this the U. S. produced 55,726,945, Mexico 46,962,738, Bolivia 21,999,966, Australasia 12,507,335, Germany 5,818,106, and the rest scattering. The U. S. coining value of silver is $1.29 per oz. U. S. coins are 900 parts silver and 100 copper, a dollar weighing 412.5 grs. (see DOLLAR). Sterling silver is 925 silver and 75 copper. Dec. 1897 the value of gold was $20.67, and of silver 57 cts. per oz. troy. Oct. 1, 1896, the U. S. had 437,202,141 silver dollars, of which 56,513,178 were in circulation; $75,354,781 subsidiary silver coins, of which $60,228,298 were in circulation. In 1895 there was used in the industrial arts in the U. S. 9,419,552 oz. of silver. See ASSAY and COINAGE.

Silver, THOMAS, 1813–1888. American inventor of a marine governor for engines 1854, adopted in several European navies.

Silver Ammonium. $(NH_3Ag)_2$. Deep blue liquid with metallic luster, made by the action of sodium ammonium on silver chloride.

Silver-bell Tree. Small trees of the genus *Mohrodendron* (*Halesia*), natural family *Styracaceæ*, with showy white flowers, natives of the s.e. U. S.; called Snowdrop Tree.

Silverberry. *Elæagnus argentea.* Shrub of the natural family *Elæagnaceæ*, with silvery leaves and fruit, native of the n.w. U. S.

Silver Bromate. $AgBrO_3$. Tetragonal crystals, unaffected by sunlight; made by precipitating silver sulphate with potassium bromate, and crystallizing from hot water.

Silver Bromide. AgBr. Bright yellow precipitate, obtained by treating silver nitrate with a soluble bromide. It occurs native in small quantities, and is used in photography.

Silver Carbonate. Ag_2CO_3. Prepared from ammonium silver nitrate, it forms transparent, lemon-yellow needles, or rhombohedra, which polarize light. It blackens in light, and loses carbon dioxide at 200° C.

Silver Chlorate. $AgClO_3$. White, opaque, tetragonal columns; mpt. 230° C., sp. gr. 4.43; soluble in water; made by passing chlorine into water containing silver oxide in suspension.

Silver Chloride. AgCl. Occurring in nature as HORN-SILVER (q.v.); white, curdy precipitate, obtained by adding a soluble chloride or hydrochloric acid to silver nitrate; soluble in ammonia water. Dry silver chloride absorbs 10 per cent of ammonia, forming ammonio-silver chloride, $2AgCl.3NH_3$, a white compound. It is decomposed by light, and is used in photography.

Silver Cyanate. AgCNO. White, anhydrous powder, sp. gr. 4.004. It blackens on heating, fuses, and takes fire. It is made by precipitating silver nitrate with potassium cyanate.

Silver Cyanide. AgCN. White, curdy precipitate, obtained by adding a soluble cyanide to silver nitrate; soluble in ammonium hydroxide and in potassium cyanide solution. The solution in potassium cyanide is used for silver plating various metals with the aid of the electric current. It is not affected by sunlight.

Silver Fluoride. AgF. Extremely hygroscopic, yellowish-brown substance; sp. gr. 5.85; made by treating the oxide or carbonate with hydrofluoric acid and evaporating.

Silver Glance. Common name for ARGENTITE (q.v.).

Silver Grain. Wood which when split radially exhibits the sides of numerous medullary rays as shining specks or small patches.

Silver Grays. Conservative Whigs, who withdrew from the N. Y. Convention of 1848. Many of them had gray hair.

Silver Hydrozoate. AgN_3. Prisms, melting at 250° C. and exploding with terrific violence; insoluble in water, decomposed by light, soluble in ammonia; similar in its properties to silver chloride.

Silver Iodate. $AgIO_3$. White, crystalline substance, unaffected by light; made by the action of iodine in alcoholic solution on silver oxide.

Silver Iodide. AgI. Natural and artificial varieties form hexagonal crystals, isomorphous with greenockite (CdS). The color varies from lemon-yellow to olive-green. Sp. gr. 5.0 to 5.6; made by heating iodine and silver; acted upon by light; used in photography.

Silver Nitrate (LUNAR CAUSTIC). $AgNO_3$. Rhombic crystals, made by dissolving silver in nitric acid and evaporating the solution. Not changed in the light unless it comes into contact with organic substances, when it blackens. It disintegrates flesh, and is used by physicians to remove warts and other superfluous growths; also used as an ingredient in indelible ink.

Silver Nitrite. $AgNO_2$. Crystallizing in needles, made by adding potassium nitrite to a concentrated silver nitrate solution; soluble with difficulty in water; used in organic syntheses.

Silver Oxide. Ag_2O. Dark brown, amorphous powder, made by adding a soluble hydroxide to a silver nitrate solution. It dissolves in ammonium hydroxide, forming black crystals of the composition $Ag_2O.2NH_3$, fulminating silver. Silver also forms a suboxide, Ag_4O, and a peroxide, AgO or Ag_4O_3, similar to the copper compounds.

Silver Perchlorate. $AgClO_4$. White powder, mpt. 486° C.; made by treating silver oxide with perchloric acid.

Silver Phosphate. Ag_3PO_4. Yellow, insoluble compound, obtained by treating silver nitrate with a soluble phosphate.

Silver Plating. Solution of silver nitrate in water is carefully precipitated with potassium cyanide and the silver cyanide is filtered out and washed with water. It is then dissolved in a water solution of potassium cyanide, and this constitutes the plating solution. The articles to be plated are carefully cleaned and hung in the solution, being connected to the negative pole of a battery or dynamo; a plate of silver

is also hung in the same solution and attached to the positive pole. This maintains the strength of the solution. Potassium cyanide should be added from time to time, as the solution should always have a decided odor of it. The solution should be protected from dust.

Silver Standard Countries. Bolivia, Central America, China, Colombia, Ecuador, India, Mexico, and Russia.

Silver Stick. In the British Court, the title of the lieutenant and the standard-bearer of the corps of gentlemen-at-arms; also the field officer of any of the guard regiments.

Silver Subchloride. Ag_4Cl_2?. Black or brown powder, melting to a yellow mass of silver and silver chloride; made by treating silver with a solution of cupric or mercuric chloride.

Silver Sulphate. Ag_2SO_4. Small rhombic prisms; soluble with difficulty in water; obtained by dissolving silver in sulphuric acid.

Silver Sulphide. Ag_2S. Regular or rhombic crystals, or amorphous powder; sp. gr. 7.1 to 7.36; made by heating silver in sulphur vapor, or by passing hydrogen sulphide into a silver salt solution. It occurs in nature as ARGENTITE and ACANTHITE (q.v.).

Silver Sulphite. Ag_2SO_3. White, curdy precipitate, obtained on adding sulphurous acid to silver nitrate. It blackens when exposed to light.

Silver-Thaw. Fine rain or Scotch mist, deposited on cold objects and frozen by reason of their coldness. The ice thus formed is always clear and transparent, and gives a silvery sheen to the objects. The weight of the ice frequently breaks limbs of trees, telegraph wires, etc.

Silver-Tree. *Leucodendron argenteum.* Small tree of the natural family *Proteaceæ*, with lanceolate silvery leaves, native of S. Africa.

Silverweed. *Potentilla anserina.* Low trailing herb of the natural family *Rosaceæ*, with yellow flowers and leaves silvery-white on the lower surface, widely diffused in the n. temperate zone.

Silvestre, THEOPHILE LOUIS, 1823–1876. French critic and historian of art. *Delacroix*, 1864; *Th. Rousseau*, 1868.

Silvia, ST., ab. 400. Of s. France; sister of Rufinus, Consul 392; supposed author of *Peregrinatio ad loca sancta*, pub. 1887.

Simarubaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 33 genera and ab. 110 species, mostly trees, natives of tropical and warm countries.

Simeon. Second son of the patriarch Jacob, and ancestor of one of the twelve tribes of Israel.

Simeon, CHARLES, 1759–1836. English Evangelical leader. *Horæ Homileticæ*, 17 vols., 1815–28; *Works*, 21 vols., 1832–33.

Simeon Stylites, ab.391–459. Syrian fanatic, who spent 30 years on a pillar 60 ft. high; revered as a saint and imitated by many.

Simia. Genus ANTHROPOMORPHA (q.v.) or Man-like Apes, including the Mias or ORANG-UTAN (q.v.) of Sumatra and Borneo.

Simiadæ (QUADRUMANA, PITHECI, or SIMOIDEA). Apes and Monkeys; sub-order of Primates, characterized by having the posterior limbs furnished with an opposable hallux, shorter

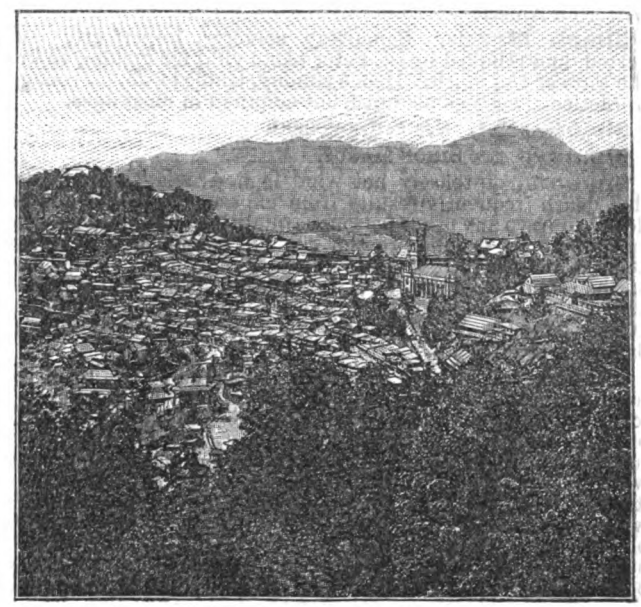
Death's Head Monkey (*Chrysothrix sciurea*).

than the other digits, rendering the feet fitted for grasping in climbing trees, rather than for walking. The canines are prominent, and there is a diastema behind the lower and in front of the upper, to allow of their overlapping. The body is hairy and the tail often long and prehensile. The orbits of the eyes are shut off from the temporal fossa, and look forward. The facial angle in the adult rarely exceeds 30° (in *Chrysothrix* it is nearly 60°). The face is more human in appearance in the young. The pinna of the ear is rounded and human-like. They live in companies in tropical forests, with the strongest male for a leader, and feed chiefly on fruits and seeds, but also on insects, eggs and birds. The female bears one or at most two young, which it tends with great care and affection. The sections included are *Arctopithecini*, *Platyrhina*, and *Catarhina*.

Similar Figures. In Geometry, those of the same form. Similar polygons have equal angles and proportional sides. Similar solids of revolution are generated by the revolution of similar figures.

Simile. Figure of speech comparing two objects by like or as; resembling metaphor, but weaker.

Simla. Town of Hindustan, on the slope of the Himalayas, 170 m. n. of Delhi; socially important as a summer resort;



General View of Simla.

government headquarters in the hot months since 1864; settled 1819. It exports opium, fruits and shawl-wool. Altitude 7,048 ft., mean temperature 55° F. Permanent pop. ab.16,000.

Simler, JOSIAS, 1530–1576. Prof. Zurich 1552. *De Republica Helvetiorum.*

Simmons, EDWARD EMERSON, b.1852. S.A.A. 1888. American painter.

Simmons, FRANKLIN, b.1842. American sculptor.

Simmons, JAMES FOWLER, 1795–1864. U. S. Senator from R.I. 1841–47 and 1857–62.

Simmons, JOSEPH EDWARD, LL.D., b.1841. Pres. New York Stock Exchange 1884–86; pres. Board of Education 1886–89.

Simms, WILLIAM GILMORE, 1806–1870. American novelist. *Guy Rivers*, 1834; *The Yemassee*, 1835; *Hist. S. Carolina*, 1840; *Beauchampe*, 1842; *Life of Marion*, 1844.

Simnel, LAMBERT, ab.1475–ab.1535. Yorkist claimant to the throne of England, personating Edward, Earl of Warwick; defeated at Stoke, June 16, 1487; afterward employed in the household of Henry VII.

Simon. 1. See PETER. 2. Another apostle, Zelotes, or "the Canaanite," formerly of the party called Zealots.

Simon, ÉTIENNE, 1747–1809. Belgian explorer, in Brazil 1795–1804; author of books of travel and history.

Simon, SIR JOHN, LL.D., D.C.L., b.1816. London physician and official, author of reports on sanitation. *Pathology*, 1850.

Simon, JULES, 1814–1896. Lecturer on Philosophy at the Sorbonne 1839–51; Deputy 1848 and 1863; opposed to the empire; Minister of Instruction 1871–73; ed. *Siècle* 1874; Senator 1875, Prime Minister 1876–77; author or editor of many philosophical and political works. *Natural Religion*, 1856, tr. 1857.

Simon, PEDRO ANTONIO, ab.1560–ab.1630. Flemish Franciscan, missionary in New Granada from ab.1590; historical writer.

Simon, RICHARD, 1638–1712. French theologian and con-

troversialist, Oratorian 1662–78. His *Critical Hist. O. T.*, 1678. tr. 1682, and *Hist. Text N. T.*, tr. 1689, anticipated the modern science of biblical criticism; his *Commentateurs du N. T.*, 1693, attacked the Fathers and provoked a reply from Bossuet. *Texte et Versions du N. T.*, 1695; *Lettres*, 1700–5; *Bibliothèque Critique*, 1708. His works aroused the wrath of Protestants as well as Catholics.

Simond, ALFRED, 1740–1801. Brazilian botanist, in Guiana (to which his books chiefly relate) 1776–88. *Flora Brasilia*, 1800.

Simonds, WILLIAM, 1822–1859. American writer for boys. *Aimwell Stories*, 1853–60.

Simonians. Gnostic sect, taking their name from SIMON MAGUS (q.v.).

Simonides, OF AMORGOS, 7th cent. B.C. Greek satirical poet.

Simonides, OF CEOS, 556–468 B.C. Greek lyric poet, winner of 56 prizes; long at Athens, where he wrote on martial and patriotic themes; at Syracuse from 478. Fragments only remain.

Simonin, LOUIS LAURENT, b.1830. French geologist and writer on America.

Simon Magus. Samaritan sorcerer, imperfectly converted, and rebuked by St. Peter (Acts viii.) for seeking to buy the gifts of the Spirit. Hence simony, traffic in Ch. patronage; a practice always condemned, but common in most ages.

Simonoseki. See SHIMONOSEKI.

Simony. See SIMON MAGUS.

Simoom. Intensely hot wind in n. Arabia, so oppressive that death frequently results from exposure to it, but not believed to have any other poisonous qualities. The intense heat appears to be peculiar to the central portion of the storm, about which there is a rapid gyratory movement on the part of the remainder of the air. It occurs in spring and summer, and seldom lasts longer than a few minutes; twenty minutes, at the outside. Very similar winds occur in the deserts of Sahara and of Sinde.

Simple Harmonic Motion. That to and fro, resulting from the projection in a vertical plane of a point moving uniformly in a horizontal circle of reference. Instances occur in physics, especially in optics and acoustics. An example is furnished by a particle vibrating under the action of a force which is proportional to the displacement of the particle from its mean position. The condition of the moving point defined with reference to its position and direction of motion is its phase. Phase is also defined as the fraction of a period that has elapsed since the point last passed through its mean position in the positive direction. If the point of maximum elongation be not the position of the body when time begins to be reckoned, the interval, positive or negative, till the body reaches this position is called the epoch. See AMPLITUDE and PERIOD.

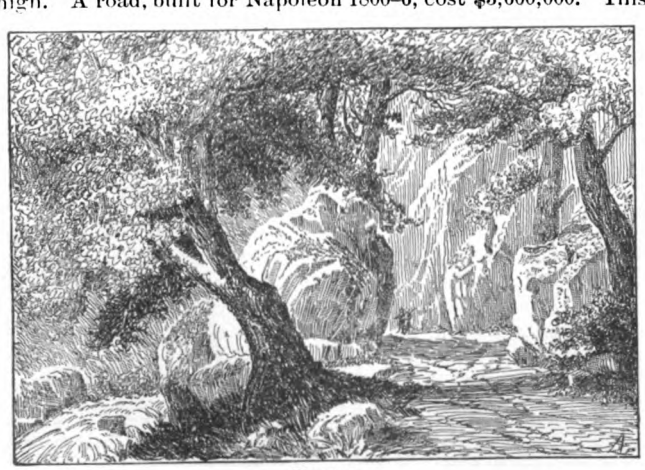
Simplicea (ASCIDIÆ SIMPLICES). See ASCIDIANS.

Simplicidentata. See RODENTIA.

Simplicius. Pope 468–483. He condemned the Monophysites.

Simplicius, 6th cent. Neoplationist at Athens, commentator on Aristotle.

Simplon. Pass from Canton Valais into Italy, 6,218 ft. high. A road, built for Napoleon 1800–6, cost $3,600,000. This



Simplon.

road, extending from Glys to Domodossola, a distance of ab. 38 m., is 6,592 ft. above the sea, and from 25 to 30 ft. wide. It passes through several extensive tunnels, over 611 bridges, and has 20 stations for travelers. It was greatly injured by storms in 1834, '39, '49, making the Sardinian side nearly impassable.

Simpson, EDWARD, U.S.N., 1824–1888. Lieut. 1855; active on the Atlantic and the Gulf 1863–65; Captain 1870, Commodore 1878, Rear-admiral 1884. *Ordnance*, 1862.

Simpson, SIR GEORGE, 1796–1860. Scottish traveler, Gov. of Rupert's Land 1822–41; knighted 1855. *Journey Round the World*, 1847.—His cousin, THOMAS, 1808–1840, led an important expedition to the Mackenzie River and along the Arctic coast 1836–40.

Simpson, JAMES HERVEY, U.S.A., 1813–1883. Explorer of a route from Utah to the Pacific 1859–61; military engineer.

Simpson, SIR JAMES YOUNG, M.D., D.C.L., 1811–1870. Prof. of Midwifery Univ. Edinburgh 1840; discoverer of the anæsthetic uses of chloroform, which he introduced 1847; Baronet 1866. *Obstetric Memoirs*, 1856; *Archæological Essays*, 1872.—His nephew, assistant, and editor, ALEXANDER RUSSELL, b. 1835, succeeded to his chair. *Obstetrics and Gynæcology*, 1880.

Simpson, JOHN PALGRAVE, 1805-1887. English playwright; biographer of Von Weber.

Simpson, MATTHEW, D.D., LL.D., 1811–1884. Pres. Indiana Asbury (now De Pauw) Univ. 1839–48; M. E. bp. 1842; eminent orator, much admired by Pres. Lincoln. He rendered notable service to the Union 1861–65. *Hundred Years of Methodism*, 1876; *Cyclopædia of Methodism*, 1878; *Lectures on Preaching*, 1879.

Simpson, THOMAS, F.R.S., 1710–1761. Prof. of Mathematics at Woolwich 1743. *Fluxions*, 1737–50; *Laws of Chance*, 1740; *Algebra*, 1745; *Geometry*, 1747; *Trigonometry*, 1748; *Select Exercises*, 1752.

Simpson River. In British Columbia, flowing into the Pacific Ocean.

Simrock, KARL, 1802–1876. German poet, prof. Bonn from 1850; tr. *Nibelungenlied*, 1827; *Reineke Fuchs*, 1845; *Edda*, 1851; *Beowulf*, 1859, and other old poems, besides Shakespeare's *Sonnets*, 1867, and some of the plays.

Sims, GEORGE ROBERT, b.1847. English playwright and novelist. *Romany Rye*, 1882.

Sims, JAMES MARION, M.D., LL.D., 1813–1883. Surgeon, in New York from 1853; founder of the Women's Hospital 1855–58; in Europe 1861–68; organizer and head of an ambulance corps in the Franco-Prussian war 1870; pre-eminent as a gynæcologist.

Sims, WINFIELD SCOTT, b.1844. Inventor of an electric motor 1872, and of torpedo boats, used in U. S. navy.

Simson, ROBERT, 1687–1768. Prof. Glasgow 1711–61. *Sectiones Conicæ*, 1735; his *Elements of Euclid*, 1756–62, supplied a basis to most modern text-books. *Opera*, 1776.

Simulation. Counterfeiting a disease. Sometimes it is a manifestation of a nervous disorder; at others it is a means to accomplish an ulterior purpose, *e.g.*, the transference to a hospital of a prisoner condemned to hard labor.

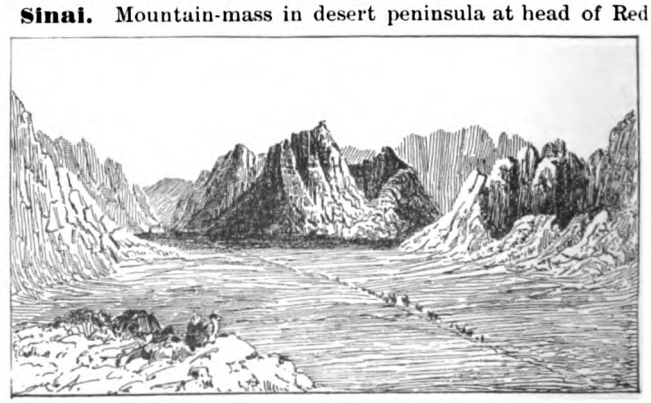
Simultaneous Equations. Those which are satisfied by the same values of the unknown quantities. In the relations of loci, the simultaneity of their equations is the condition of intersection of the loci, and values which make the equations simultaneous determine the intersection.

Simultaneous Values. Those at or for the same time.

Sin. Transgression of duty or of law considered as offense against God.

Sin, WILDERNESS OF. Region through which the Israelites wandered after coming out of Egypt.

Sinai. Mountain-mass in desert peninsula at head of Red



Plain Er-Rahah—Mount Sinai

Sea, over 8,000 ft. high; scene of the giving of the Law, through Moses, to Israel. The peninsula, the scene of the Israelite

wanderings, is ab. 140 m. long n. to s. In different localities of it are ancient inscriptions. Politically it now belongs to Egypt. See HOREB.

Sinaitic Inscriptions. Uncial manuscripts of the Greek Bible, discovered by Constantine Tischendorf in 1844 in the convent of St. Catharine on the range of Mt. Sinai, in a scrap basket. The manuscript is now in St. Petersburg. See CODEX.

Sincerity. That form of truthfulness which consists in a habitual freedom from duplicity.

Sinclair, SIR JOHN, 1754–1835. Scottish M.P. 1780–1811; Baronet 1786; prolific writer. *Hist. Revenue of British Empire*, 1784–89; *Statistical Account of Scotland*, 21 vols., 1791–99.—His daughter, CATHERINE, 1800–1864, wrote many novels and books, religious, juvenile, or descriptive. *Modern Flirtations*, 1841; *Beatrice*, 1852.

Sindbad. See SEVEN WISE MASTERS.

Sinde, SCINDE, or SINDH. Province of w. India, conquered by Mohammedans ab.712, by Akbar of Delhi 1592, by Persia 1739, and by the English 1843. Area 54,435 sq. m., pop. near 3,000,000. Capital, KARACHI (q.v.).

Sindia, or SCINDIA. Mahratta rulers of Gwalior, n. central India, from 1744; hostile to the British 1779–1844. Their power began 1743 in Malwa.

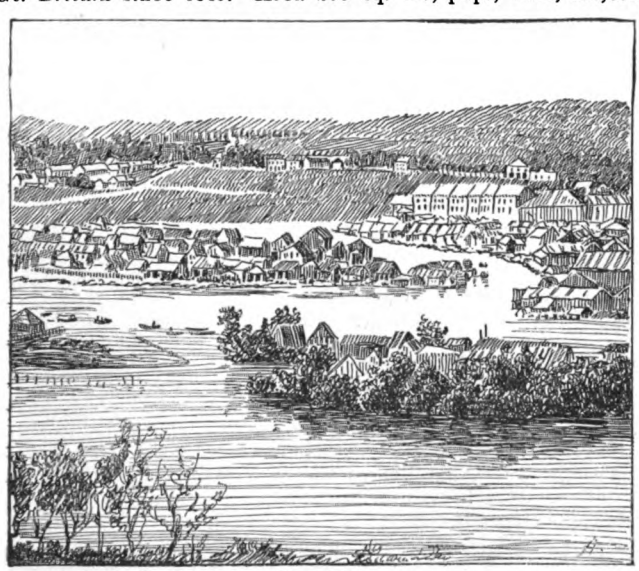
Sine. Trigonometric function: ratio of the ordinate of any point in the terminal line of the angle (the initial line being the axis of x) to the distance of that point from the vertex of the angle.

Sin-Eating. It was formerly the custom in parts of rural England and Wales to hire poor people at funerals to take upon them the sins of the deceased. A loaf and a bowl of beer was given, which the sin-eater ate and drank. The usage may have originally been limited to the clergy, but was afterward continued and practiced as a profession by others.

Sines, LAW OF. See LAWS OF REFRACTION.

Singanfoo. Former capital of China; on the Wei, a branch of the Hoang Ho; notable for its commerce and remains of antiquity. Pop. ab.200,000.

Singapore. 1. Island s. of Malay Peninsula, held by Gt. Britain since 1819. Area 206 sq. m.; pop., 1891, 182,650.



Singapore.

2. Its capital, and that of the Straits Settlements since 1853; of modern growth and great commercial importance. Pop., 1891, 160,000.

Singeing Cake. English term for the HOST (q.v.) in the Latin Church.

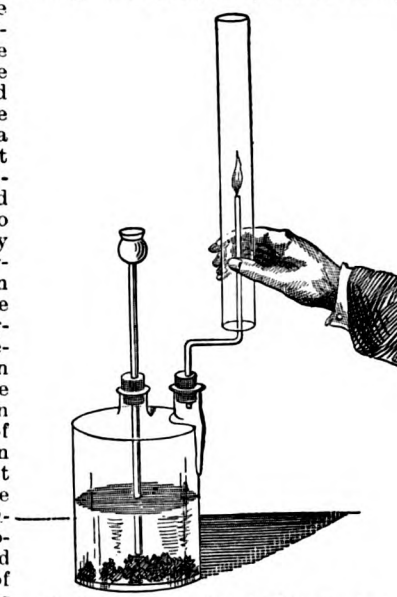
Singer, ISAAC MERRITT, 1811–1875. American improver and patentee of sewing-machines.

Singerly, WILLIAM MISKEY, b.1832. Publisher of Phila. *Record* since 1877.

Singhalese. See CEYLON.

Singing. Art of uttering music composed for the human voice. What constitutes good singing depends largely on the state of music and the conceptions which prevail among different peoples and at different periods touching the purpose of the art. Among savages it is, like dancing, more often a religious function than an entertainment, and the idea of beauty is not considered. After the invention of opera, with its artificial forms, sensuous beauty of tone and perfection of phrasing and execution were chiefly admired and sought. With the development of the dramatic element in opera, the need of truthfulness of expression was more felt, and greater importance was attached to significant enunciation of the words. Vocal composition and singing became more declamatory, and less attention was bestowed upon mere beauty and flexibility of voice. Singing is also much influenced by the peculiarities of languages, and this has helped to give rise to a variety of schools and methods; but the professed aim of all is to produce tones which shall be true in pitch and consistent in quality, to make the voice full, powerful, flexible, and capable of enduring a strain, and to secure distinctness of enunciation and truthfulness of declamation.

Singing Flames. If a small gas flame be produced at the end of a tube terminating in a fine point, and be slowly passed up into a wide glass tube, some particular position will be found at which the flame alters its character and begins to sound a note the pitch of which is a little higher than that of the tube when sounded by itself. Should the flame not begin to sound immediately when the most favorable position has been reached, it can often be made to respond by singing to it a note corresponding very nearly in pitch to that which the flame will produce when in action. A flame of hydrogen has been found to be more prompt in its action than one of coal gas. An instrument termed the pyrophone has been devised by arranging a set of such tubes of various pitches. The air in the tube is made to vibrate by the heat of the flame. See PYROPHONE, and HARMONICA, CHEMICAL.



Singing Flame, or Chemical Harmonica.

Single-Acting Engine. Form in which the motor fluid acts on one side of the piston only, the other side being in connection with the atmosphere to receive its pressure, or with the condenser. Such are the CORNISH ENGINE (q.v.) and most of the CALORIC and GAS ENGINES (q.v.).

Single Altitude. Method of determining time. The altitude of the sun or a star is measured with the sextant; then, in the spherical triangle having its vertices at the zenith, the pole, and the star, three parts will be known; therefore the angle at the pole (the hour angle) can be computed.

Single Riveting. Connection of two plates by a single row of rivets. The strength of such a joint is usually ab. 60 per cent of the strength of the plate itself. By adding another row of rivets the strength may be raised to ab. 75 per cent of that of the plate.

Single-Stick. Straight stick with a basket-handle to protect the hand, used in practicing the broad-sword exercise. There are seven cuts, as many corresponding guards, and three thrusts.

Single Tax. The method of obtaining public revenue by taxing land only and not the improvements upon it; proposed in 1887 by Henry George.

Single Touch. One of the three principal methods of magnetization. It consists of moving the pole of a powerful magnet from one end to the other of the bar to be magnetized, the motion always taking place in the same direction. The magnetism developed by this method is usually feeble, and the method is employed only for small magnets. It has also the disadvantage of often developing consequent poles.

Sing Sing. Village of Westchester co., N. Y., on the Hudson, 31 m. n. of New York; site of a state prison.

Singular Points. Those points of a curve having peculiar properties: points of inflexion, multiple points, cusps, nodes, abrupt and conjugate points, etc.

Sinim. Biblical name for the Seres, or ancient Chinese.

Sinistral (LEFT-HANDED). Gastropod shell whose mouth faces the spectator on the left when the shell is viewed with the spire pointing upward.

Sinistrorse. Twining vines which wind around a sup-

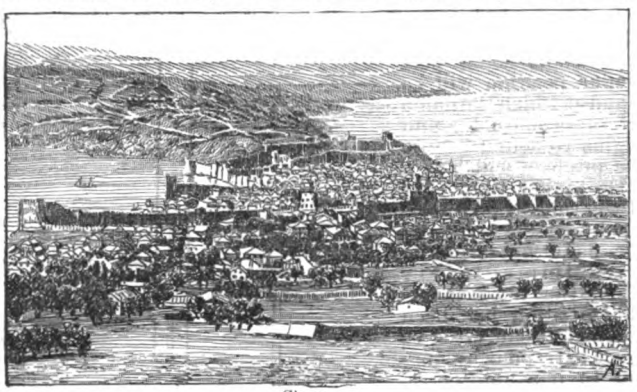
port from right to left, and thus in an opposite direction to the apparent motion of the sun; *e.g.*, the Hop.

Sinker-Bar. In well-drilling machinery, heavy rod of iron, ab. 18 ft. long, occupying a position in the string of tools just above the jar.

Sink Hole. Cavities formed in limestone regions by rain or running water; known in England as Swallow-hole.

Sinking Fund. Financiering plan by which a certain amount of money is laid aside annually, the principal and interest of which are expected to pay off a funded debt by the end of a given period.

Sinope. Ancient capital of Pontus, Asia Minor, on the Black Sea; taken by Romans 72 B.C., and by Turks 1461.



Sinope.

Near it a Turkish fleet was destroyed by Russians, Nov. 30, 1853, with loss of 4,000 lives. Pop. ab.7,500.

Sinter. Cellular siliceous or calcareous deposit formed on evaporation of water at the outlet of some mineral springs.

Sinuate. Wavy margins of certain leaves and other organs.

Sinupalliata. Group of siphoniate Lamellibranchs, including forms having the pallial impression more or less deeply bowed forward at the posterior end. This bay represents the attachment of the muscles that retract the long siphon. Here belong the VENERIDÆ, MACTRIDÆ, MYIDÆ, PHOLADIDÆ, and TEREDIDÆ (q.v.).

Sinus. In Anatomy, a pocket or dilatation in bone or other structure, as the frontal sinus, a cavity in the frontal bone between the eyebrows, communicating with the air through the nose; the sinuses of the dura mater are blood channels for venous blood.—In Surgery, an abnormal canal usually produced by ulceration and through which the products of inflammation may be discharged.

Sinus. Indentation at the base of a leaf or other flat organ.

Sioux (DAKOTAS). Confederacy of Indian tribes possibly related to the Six Nations of New York. The territory originally occupied included Wisconsin, Minnesota, and Iowa. They were

Ghost Dance of the Sioux Indians.

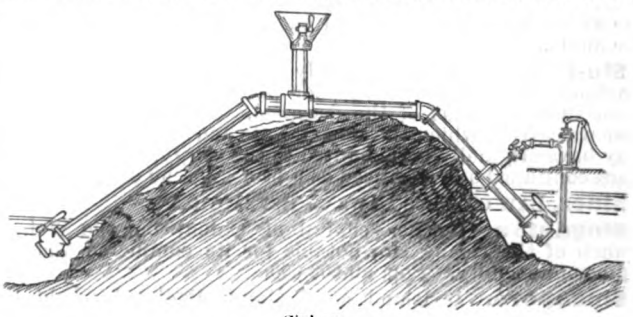
driven West because of a massacre of Minnesota pioneers in 1862. In 1876, under Sitting Bull, they fought U. S. troops, their chief escaping to Canada. They number ab.50,000. The tribes included are: Santees, Yanktons, Tetons, Sissetons, Brules, Minikanyes, and Unkpapas. Besides these, there are tribal offshoots, such as the Assiniboines of L. Winnipeg, the Crows of Montana, Hidatsa, Mandans, and the Winnebagoes of e. Wisconsin. The Sioux proper are great warriors, cruel, and cunning. They love to gamble, paint and ornament themselves. They are nomads, and practice dances in which they endure self-inflicted tortures.

Sioux City. Capital of Woodbury co., Iowa, on the Missouri; founded 1849; of recent growth. It is a railroad center of importance, and has large packing houses and varied manufactures. Pop., 1890, 37,806.

Sioux Falls. Capital of Minnehaha co., S. Dak.; on the Big Sioux; chartered 1877 and 1883; noted for its quarries. Pop., 1890, 10,177.

Sioux War. 1876; occasioned by the refusal of the Sioux to keep a treaty with the U. S., by which they were to relinquish a certain amount of territory and retire from it by Jan. 1, 1876. They continued to roam about Wyoming and Montana, burning, robbing, and killing, whereupon the government sent a force under command of Gens. Terry and Crook to subdue them. Gen. Custer and his whole force of nearly 300 men were destroyed in a battle, but the Sioux were finally defeated and driven across the border into Canada.

Siphon. Instrument by which a mass of liquid may be removed from a vessel to a lower level without moving the vessel. In its simplest form it consists of a U tube, the shorter leg of which is immersed in the liquid, while the longer opens into the air at a level lower than that of the liquid. The flow takes place by reason of the difference of pressure at the two levels of the tube, due to the weight of the columns and to the



Siphon.

pressure of the air.—In Engineering, a bent pipe for carrying water over an elevation less than 30 ft. in height. A long siphon will not continue permanently in flow unless a pump be occasionally operated at the summit to remove the air that collects there.

Siphon. In Botany, certain elongated cells in the thallus of some red *Algæ*, grouped in the order *Siphoneæ*.

Siphonaceæ. Order of filamentous *Algæ* of the sub-class *Chlorophyceæ*. The filaments are aseptate.

Siphon Condensers. See CONDENSERS.

Siphoniata. Division of Lamellibranchs, in which the posterior parts of the mantle edges are fused to form long tubular siphons. Here are included the Cockles (*Cardiidæ*), *Cyprinidæ*, *Veneridæ*, *Mactridæ*, *Myidæ*, and the Boring Mussels (*Pholadidæ*). These families may be put under the two groups, *Integripalliata* and *Sinupalliata*.

Siphonochlamyda (SIPHONOSTOMATA). Division of Prosobranchs, including forms with the aperture of the shell notched or prolonged into a canal, for the exit of the siphon. The groups included are: *Rachiglossa*, *Toxiglossa*, and *Tænioglossa* (in part, *i.e.*, siphonostomatous *Orthoneura*, as *Cypræa*, Strombus, Triton).

Siphonodentalium. See SCAPHOPODA.

Siphonophora. Free-swimming polymorphic colonies of *Hydrozoa*. They have a common contractile stem, medusoid buds, nutritive polyps, and usually also nectocalices, hydrophyllia, dactylozoöids, etc. They are divided into the *Physophoridæ*, *Physalidæ*, *Calycophoridæ*, and *Discoideæ*.

Siphonopoda. See CEPHALOPODA.

Siphonostomata, or PARASITICA. Group of parasitic Copepods or fish-lice, whose mouth-parts are adapted for sucking; the structure is more or less degraded, and the segmentation is lost or obscure. Sometimes the body is reduced to nothing but a branched reproductive organ. The males are rare, usually small, sometimes parasitic on the female. *Actheres* is an example. See SIPHONOCHLAMYDA.

Siphonostomatous. Having the lip of the aperture of the shell of Univalves prolonged into a canal.

Siphon Recorder. Instrument invented by Lord Kelvin, designed to receive the signals transmitted through a submarine cable. The signals are zigzag lines, drawn with ink discharged from a light glass siphon, which is moved by a light coil of fine copper wire suspended by a silk fiber between the poles of a powerful electromagnet. The paper in front of

the siphon tube is movable by clockwork, and the ink reservoir is electrified.

Siphons. Tubes formed by extensions of the mantle in Mollusks, through which water is inhaled and exhaled for respiratory, nutritive, or locomotor purposes.

Siphuncle. Tube which unites the chambers of such Cephalopods as the Pearly Nautilus.

Sipunculacea. See GEPHYREA.

Sipunculoidea, or SIPUNCULIDÆ. See ACHÆTA.

Sir. Title of baronets, knights, and formerly of clergymen.

Siraj-ud-Daula. See SURAJAH DOWLA.

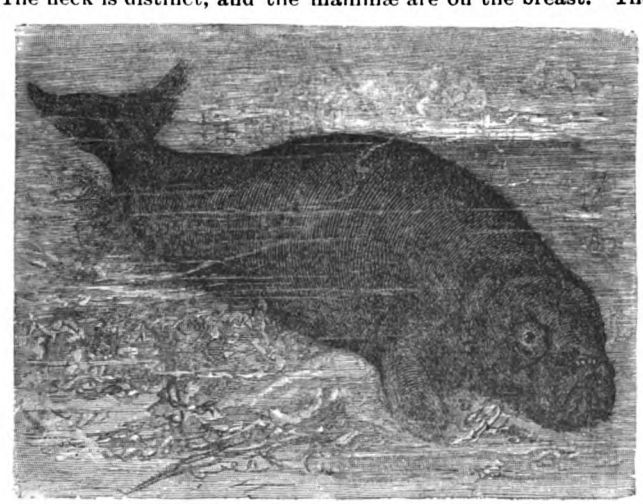
Sirbonian Bog. According to Strabo, deep lake on the coast of Egypt, e. from Pelusium, impregnated with asphalt. Diodorus says it was overgrown with reeds. At present its site is covered with sand. One of the chief routes from Egypt to Asia passed along a narrow ridge between sea and lake, which was dangerous in case of a n. wind.

Siredon. See AXOLOTL.

Siren. Acoustical apparatus for measuring pitch, devised by Seebeck and De Latour, and improved by Helmholtz. The simplest form of the latter consists of a cylindrical brass box, the top of which is pierced with a ring of small holes bored obliquely; just above this and nearly in contact is a movable circular disk, pierced with the same number of holes similarly arranged, except that the obliquity is in the opposite direction. This disk is capable of revolving upon a vertical axis. Through the bottom of the box is an opening through which air or steam may be forced; this air, passing through the oblique holes in the top, strikes against the sides of those in the disk and causes the latter to revolve rapidly. As the rotation of one plate upon the other causes the holes to be alternately opened and closed, the air escapes in successive puffs, the frequency of which depends upon the rate of rotation and upon the number of holes, and a note is emitted whose pitch is equal to the product of the number of revolutions per second into the number of holes in the disk. The latter is a constant of the instrument, and a speed indicator will enable one to determine the former. Thus by bringing the siren into tune with any musical note, the pitch of that note will be known.

Siren. See PERENNIBRANCHIATA.

Sirenia (CETACEA-HERBIVORA). Order of adeciduate, placental Mammals, formerly included in the order *Cetaceu.* They are aquatic and herbivorous, with sparse hair on the body, no hind limbs, but body terminating in a horizonal fin. The neck is distinct, and the mammæ are on the breast. The



Dugong (*Halicore dugong*).

incisors are two sets, a milk dentition being present. They feed on sea-weed and are between Whales and Seals, with affinities to the Ungulates. The Sea-Cow, Manatee, and Dugong are examples. They live near the mouths of large rivers, and do not grow to any extraordinary size. Unlike the Whales, the nostrils are on the snout, on which hair is present as a mustache.

Sirens. Sea-nymphs whose songs charmed and destroyed all listeners; two, sometimes three. Ulysses escaped by stuffing his companions' ears with wax, and tying himself to the mast till out of hearing. Orpheus outdid them in song, whereupon they cast themselves into the sea and became rocks.

Siricius. Pope 384–398; enforcer of clerical celibacy; active against Manichees and Priscillianists.

Sirius, or DOG-STAR. Brightest fixed star in the heavens; right ascension 6h. 40 m., declination —16° 33′, parallax 0″.380, according to Gill and Elkin. This would make the distance such that light would require 8.6 years to reach us from the star. The mass is 5.8 that of the sun, the light 42 times the sun's.

Sirocco. Hot and very dry wind in Arabia and the Sahara, usually raising oppressive clouds of dust; also a hot dry n.w. or w. wind in Natal, S. Africa, descending from the high interior country with clear weather, and stronger than the average wind. By its dryness it differs from the scirocco of Italy.

Sisal Hemp. Fiber of several species of AGAVE (q.v.). It is grown in the West Indies, and especially at Sisal, Yucatan; it is used in making cordage, and is considered superior to true hemp.

Sisenna, LUCIUS CORNELIUS, ab.120–67 B.C. Roman historian of his own time, praised by Cicero. Fragments survive.

Sisera. Canaanitish general, oppressor of the Israelites; treacherously slain by Jael.

Sismondi, JEAN CHARLES LÉONARD DE, 1773–1842. Swiss-French author of Italian ancestry, resident chiefly at Geneva. *De la Richesse Commerciale*, 1803; *Hist. Italian Republics*, 16 vols., 1807–18, abridged 1832; *Littérature du Midi de l'Europe*, 4 vols., 1813, tr. 1823; *Economie Politique*, 1819; *Hist. des Français*, 31 vols., 1821–44; *Sciences sociales*, 1836.

Sisserskite. Rare mineral alloy of iridium and osmium.

Sisterhoods. Female associations for pious and charitable work; first formed in R.C. Ch. by St. Vincent de Paul 1629–33 (see CHARITY, SISTERS OF), in Ch. of England by Dr. Pusey 1845, and in the U. S. by Dr. Muhlenberg 1852.

Sisters of Mercy. Organized in Ireland 1827, and in the U. S. 1843. They have over 200 houses, and are engaged in teaching and nursing.

Sistine Choir. That which sings at the services and functions in which the Pope takes part. It is a collegiate body, and consists of 32 choral chaplains, and is traced in part to 4th century, and more distinctly to 14th. Since 1870 its regular service of the choir has been dispensed with, though it is heard at long intervals, as at the anniversary of the Pope's consecration. It has played an important part in the history of Palestrina, Dufay, Josquin des Prés, Arcadelt, Morales, Nanini, and Allegri.

Sisyphus. King of Corinth; condemned in the lower world to roll uphill a huge stone, which always rolled back.

Sitaris. See HETEROMERA.

Sitka. Capital of Alaska; on Baranoff Is., on s.e. coast. Pop., 1890, 1,188.

Sitting Bull, 1837–1890. Sioux chief, leader of various raids and massacres. In 1876 his followers overpowered and

Sitting Bull.

slew Gen. Custer and his troops, and escaped to Canada. He surrendered 1880, but, continuing to make trouble, was attacked in his camp Dec. 15, 1890, and slain in the fight.

Situation Rent. Value of the advantage which any industrial establishment possesses over any or all other similar producers, on account of its proximity to markets for purchase or sale of goods or for labor.

Siva. One of the Hindu trinity, with Brahma and Vishnu;

represented as destroyer and renewer; celebrated in the Puranas, but not in the Vedic hymns.

Sivatherium. Fossil four-horned antelope from the Miocene of India, of elephantine size and some elephantine characters.

Six Articles, or "BLOODY STATUTE" (q.v.). Enacted in England June 28, 1539, to enforce auricular confession, clerical celibacy, transubstantiation, and other R. C. doctrines and practices. Under it 28 persons were executed. See ARTICLES OF RELIGION.

Six Nations. Confederacy of Indian tribes, Mohawks, Senecas, Cayugas, Oneidas, Onondagas (the Five Nations) and Tuscaroras. In 1722 an important council was held at Albany between their chiefs and the Governors of N. Y., Pa., and Va., resulting in a treaty by which a large part of the fur trade was diverted from the French to the English.

Six-Principle Baptists. Non-Calvinistic body, formed in R. I. 1652; once strong, now numbering less than 1,000.

Sixteen Soldiers. See FOX AND GEESE and JUROKU MUSASHI.

Sixth. See INTERVALS.

Sixtus. I. 6th bp. of Rome, ab.120 or 130.—II. Bp. 257-258; martyr.—III. Pope 432-441.—IV. FRANCESCO DELLA ROVERE, 1414-1484; general of the Franciscans; Pope 1471. He

Seal of Sixtus IV.

adorned Rome, made five nephews cardinals, plotted to murder the Medici, and involved Italy in war.—V. FELICE PERETTI, 1521-1590; Cardinal 1570, Pope 1585; energetic ruler. He hated Protestants, disliked Spain, and approved the murder of Henry III. of France.

Sixty-Six. Variety of Bézique, played by 2, 3, or 4 persons, with twenty-four cards, from 9 upward, the 10 ranking next to ace. In two-handed game six cards are dealt to each, three at a time, the thirteenth card being turned up on the table for trump. Two cards are a trick, and following suit is not required. 9 of trumps may be exchanged by a player for the turned up card, after taking a trick. A card is taken from the pack by each player after a trick is taken. The cards in the tricks count as follows: ace 11, ten 10, king 4, queen 3, knave 2, nine 0. Marriage of king and queen of the same suit, declared after winning a trick, counts 20; marriage in trump suit counts 40. After all the cards have been drawn the players must follow suit, and take the tricks if possible. When 66 is declared the play stops. The game is 7 points, as follows: making 66, the opponent having made 33 or more, counts 1; making 66, before opponent makes 33, counts 2; making 66, before opponent makes anything, counts 3. In the three-handed game the dealer takes no cards, but counts the same as the winner of the hand; if he already has 6, he must win on another's deal.

Sizar. Poor student at Oxford, Cambridge, and Dublin.

Size. See GLUE and GELATINE.

Sjöberg, ERIK ("VITALIS"), 1794-1828. Swedish poet and satirist.

Skagen, CAPE, or THE SKAW. Most northerly point of Jutland, on which is a stone lighthouse, 148 ft. high; near by is a small town of pilots and fishermen.

Skager Rack. Extension of North Sea between Denmark and Norway, connecting with Cattegat, which leads to the Baltic. Length ab.140 m., width ab.70 m.

Skalds. Old Norse poets, of whose works many fragments exist.

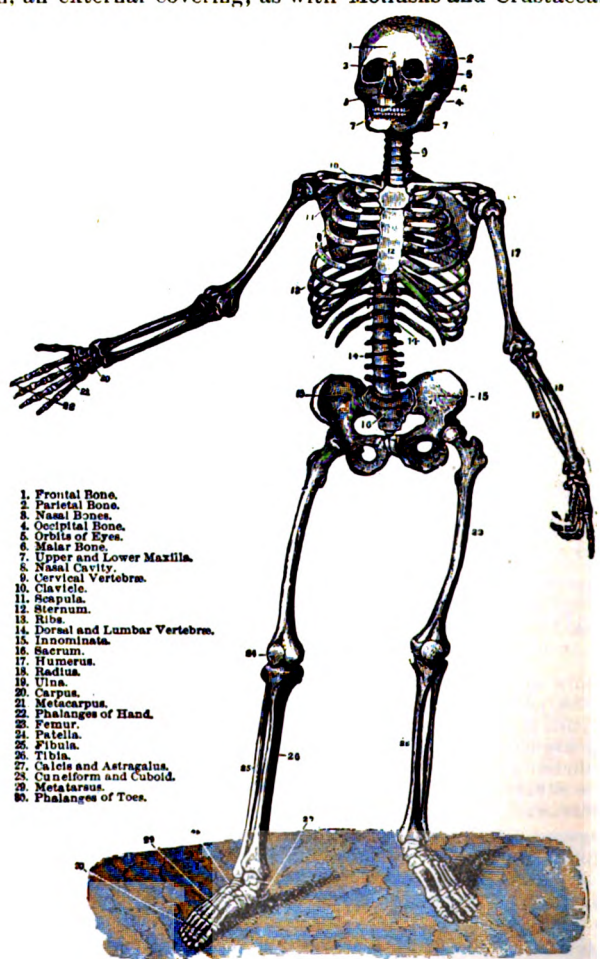
Skating. Traveling over ice on a sort of shoe with a runner, now of steel; not only a sport, but in some countries a necessary accomplishment. Indulged in out of doors at first, it came to be popular also in rinks, where the ice was at first a product of winter weather, and later artificial. Then followed roller-skating, where the ice was dispensed with, and, instead of a steel blade, boxwood rollers were attached to the shoe part of the skate, and the surface over which the skater moved was a polished floor. 100 yds., with standing start, has been made on ice in 9 sec.—$\frac{3}{5}$ of a sec. faster than a runner can make it; with a flying start it has been covered in 7 sec. A quarter-mile, with flying start, has been skated in $31\frac{1}{4}$ sec.,

Skating.

and a half, with wind, in 1 m. $5\frac{3}{5}$ sec., a mile, with wind, in 2 m. $12\frac{3}{5}$ sec.

Skeat, WALTER WILLIAM, b. 1835. English philologist, editor of *Piers Plowman*, Chaucer, and other early texts. *Etymological Dictionary*, 1882.

Skeleton. In general, the hard parts of animals; exoskeleton, an external covering, as with Mollusks and Crustaceans;



Human Skeleton.

endoskeleton, an internal supporting framework, as in Man. Many animals have both, as with the Tortoise. The skeleton

of Invertebrates is mostly of calcium carbonate, silica, or horny matter; the skeleton of Vertebrates consists of bony and cartilaginous matter, the former largely calcium phosphate. Vertebrates have a dorsal axis or vertebral column, to which the vertebra are attached, with the spinal cord; in many Reptiles, all Birds and Mammals, a breastbone, to which the ribs are attached; a skull, containing the brain; the shoulder- and hip-girdles, to which the limbs are attached. In Man there are 278 bones at birth, which at the age of 25 are reduced to 224 by the uniting of some by bony matter. They are connected by cartilaginous tissues. The various divisions are described under their several titles.

Skelligs. Three rocky islands on s.w. coast of Ireland, lying 10 m. s.w. of Valentia Island. The Great Skellig rises abruptly to 714 ft. altitude, and has two lighthouses, 372 ft. high, and the ruins of a monastery for centuries the resort of pilgrims.

Skelton, JOHN, ab.1460–1529. English satirical poet, who attacked Wolsey and the clergy. *Works*, 1843.

Skene, ALEXANDER JOHNSTON CHALMERS, M.D., b.1837 in Scot. Prof. of Gynæcology in N. Y. *Diseases of Women*, 1888.

Skene, PHILIP, 1725–1810. British officer, in America 1756–79; taken with Gen. Burgoyne. His large estate on Lake Champlain was confiscated.

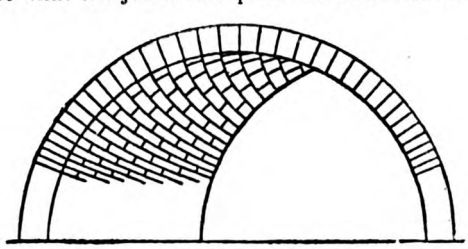
Skene, WILLIAM FORBES, D.C.L., 1809–1892. Antiquarian; historiographer of Scotland 1881; editor of sundry chronicles and other old books. *The Highlanders*, 1837; *Celtic Scotland*, 1876–80.

Skennotoka. See CAMPANULARIÆ.

Skepticism, or SCEPTICISM. Doctrine asserting the uncertainty of all human knowledge and belief. Its basis is the illusory nature of perception and the contradictions of the understanding, the two being presumably the only sources of conviction.

Sketch, MILITARY. Map of a portion of the country upon which topographical features, such as roads, woods, valleys, hills, passes, streams, etc., are delineated with sufficient accuracy to enable a commander of troops to maneuver them for marching or battle purposes. Such sketches are usually made by a reconnoissance under fire and therefore require on the part of the officer charged with this duty the characteristics of coolness and bravery, rapidity of execution, and the rare quality called coup-d'œil-militaire.

Skew Arch. One whose faces are not at right angles to its axis, so that the joints are spiral lines and the sides of the



Skew Arch.

stones are warped instead of plane. It is more difficult of construction and more costly than common arches.

Skewback. Joint of the abutment against which the arch abuts, or large stone common to both abutment and arch.

Skew-bevel Wheels. Gear wheels in which the axes of the two shafts are not parallel and do not intersect, and in which the pitch-surfaces of the wheels are hyperboloids (see GEAR WHEELS). The actual wheels are usually designed on frusta or tangent cones to the hyperboloids. They occur when a vertical shaft in a mill drives horizontal shafts on several floors, both to be continuous when the former rises somewhere near the middle of the building. They have the property of working in pairs, one on each side of the projected intersection of the two shafts, if it be desired to distribute the effort on more teeth than convenient on one wheel. When the pitch-surfaces are cylinders tangent to the circle of the gorge of the hyperboloids, the gears become HELICAL (q.v.).

Skew Determinants. Those whose conjugate elements are equal in magnitude, but differ in sign.

Skilling. Old copper coin of Denmark.

Skimmers. *Rhynchops nigra*, the Black Skimmer, has considerable white, the tail, tips of secondaries, hind neck; and in summer, when these marine birds come north, also the forehead, sides of head, and lower parts. They fly with the elongated compressed lower mandible immersed beneath the surface, to scoop up fish. See RAZOR-BILL.

Skimpings. In Cornwall, poor or worthless portion of ore that rises to the top in the operation of jigging, and is skimmed or scraped off.

Skin. Integument covering the body, serving as the organ of touch. It is composed of two principal layers, the dermis or true skin, and the epidermis or outer layer. In the skin are to be found ramifications of the nerves for the sense of touch, blood vessels, lymphatics and sweat glands. The action of tannin upon the dermis constitutes the process known as tanning, producing LEATHER (q.v.).

Skin Diseases. Those whose manifestations are located in the skin. They may be purely local or but a symptom of a derangement of the internal economy. A number of forms are included in cutaneous affections, the modern classifications recognizing about one hundred varieties.

Skin-Moths. Beetles of the family *Dermestidæ*, which attack skins and are frequently found in museums. The most destructive, *Anthrenus museorum*, is only ab. $\frac{1}{10}$th of an in. long Museum specimens should be killed with benzene, camphor or turpentine.

Skinner, JOHN, 1721–1807. Minister at Langside, Scotland, 1742–1806; imprisoned 1753; author of *Tullochgorum* and other songs. *Ecclesiastical Hist. Scotland*, 1788; *Poems*, 1809.—His son, JOHN, 1744–1816, became a bishop 1782, primus of Scotland 1788, and was one of Dr. Samuel Seabury's consecrators 1784.

Skinner, JOHN STUART, 1788–1851. Founder and editor of *American Farmer*, 1819–29; *Turf Register*, 1829–39; *Farmer's Library*, 1845–48; and *Plow, Loom, and Anvil*, 1848–51; ed. sundry agricultural books.

Skin Sensations. Changes of consciousness aroused by stimulation of the skin. They include tactile sensations and sensations of temperature. See TOUCH and TEMPERATURE SENSE.

Skip, or SKEP. Bucket or car in which coal or ore is raised to the surface from the underground workings of a mine. It usually runs between guides, but sometimes on rails.

Skittles. See BOWLS.

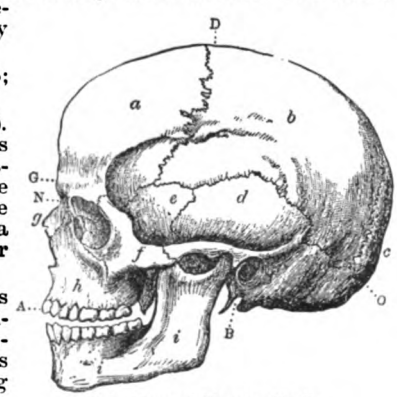
Skobeleff, MICHAEL, 1841–1882. Russian general, who conquered Khiva and Khokand 1873–74, and gained repeated victories over the Turks in Bulgaria 1877–78.

Skotograph, or SKIOGRAPH. Shadow picture taken on a sensitized plate, in a plate-holder, by ROENTGEN RAYS (q.v.). The subject is placed between the plate-holder and the Crookes' tube and the plate is developed as in the ordinary photographic process.

Skrælingar. Eskimo; so named in Norse.

Skuas (SEA-HENS). Web-footed, marine birds of the Arctic and Antarctic Oceans; like large brown gulls. They have a cere on the bill like a Puffin. They feed on other birds.

Skull. With man this is divided into the cranium, forming the brain-cavity, to which it gives protection, and consisting of 8 bones; and the face, which consists of 14 bones. Many sutures between the bones at birth are closed by bony union in the adult. The capacity of the human skull is from 60 to 110 cu. in., average 85 in. See CRANIOMETRY.



Side View of Human Skull:
a, frontal bone; *b*, parietal bone; *c*, occipital bone; *d*, temporal bone (squamous portion); *e*, sphenoid bone; *f*, malar bone; *g*, nasal bone; *h*, superior maxillary or upper jaw bone; *i*, inferior maxillary or lower jaw bone.
BD, height of cranium; GO, length of cranium; BN, basinasal length; BA, basialveolar length. (These measurements are supposed to be made in a straight line from point to point.)

Skullcap. Herbs of the genus *Scutellaria*, natural family *Labiatæ*, principally natives of the n. temperate zone.

Skunk. *Mephitis mephitica* is the common skunk. It is dark colored, with a white patch on the forehead, extending backward to the bushy tail as two stripes on the back. On each side of the anus is the opening of the perianal glands, which secrete a pungent liquid, that is forcibly ejected when the creature raises its tail, and is very irritating if it strikes in the eye. Skunks do not exhibit fear of man, and are easily tamed. They are insectivorous, but like to rob hen-roosts. It is claimed that

Common Skunk (*Mephitis mephitica*).

they suffer naturally from hydrophobia, and that from them the dog gets this disease originally.

Skunk-Bush. *Ptelea augustifolia.* Shrub of the natural family *Rutaceæ*, native of s.w. U. S. The foliage has a mephitic odor.

Skunk-Cabbage. *Spathyema fœtida.* Large-leaved herb of the natural family *Araceæ*, with a strong mephitic odor; blooming in early spring; known as Skunk-weed.

Skupshtina. Servian National Assembly.

Sky. Apparent arch of the heavens, which is blue on a clear day; this is due to the downward reflection of light from the infinitely small solid particles suspended in the atmosphere; the blue and violet rays of light are most refracted and most reflected repeatedly by these solid particles; if the particles are coarse, the light reflected is white, as with clouds. The light, not thus reflected, is transmitted yellower or redder, or is absorbed. See ATMOSPHERE, CLOUDS, DUST-FREE, and METEOROLOGY.

Skye. One of the Hebrides, off w. coast of Scotland; part of Inverness. Area 535 sq. m.; pop., 1891, 15,800, and dwindling.

Skye Terrier. Long silky-haired house-dog, 40 in. long, 10 in. high, in color gray to dark blue, it is supposed to have originated in a cross of a Skye dog with a Maltese terrier, which is doubtful.

Skyros, or SCYROS. Ancient island of Greece, to the e. of the middle of Eubœa; one of the Sporades. Its silver mines and marble quarries are no longer worked. Here Achilles concealed himself before the Trojan war. It abounds in vineyards and is well timbered. Area 79 sq. m., pop. ab. 3,200.

Slack Coal. Small or refuse coal broken from the larger pieces in handling during the operations of mining or preparing for market.

Slade, FELIX, 1789–1868. Founder of chairs of Art in Oxford, Cambridge, and Univ. London.

Slade, WILLIAM, 1786–1859. M.C. 1831–43; Gov. of Vt. 1844–46; sec. National Board of Education 1846–56. *Laws of Vt.*, 1825; *Reports of Vt. Supreme Court*, 1844.

Slag Brick. Castings made of melted slag, and used for pavements of sidewalks, and even for roadways. They have not come into general use.

Slags. Vitreous product of metals or minerals, after fusion in blast-furnaces. Silica, alumina, chloride of calcium and alum are made from slag, and it is used for roofing, like rough glass, and in thin slabs like Dutch tiles. See CINDER, BALLAST, SCORIA, and SLAG BRICK.

Slander. Oral defamation. To be actionable it must impute a criminal offense involving moral turpitude, or a contagious disease which would exclude from society, or which tends to prejudice the victim in his trade or calling, or must cause special damage.

Slang. Words and phrases not recognized by correct usage; sometimes the "jargon of thieves and vagabonds;" often merely colloquial and jocose; frequently silly and vulgar, sometimes forcible and imaginative, "poetry in the egg." Its unbridled use and the unsparing condemnation of it are alike objectionable.

Slate. Cleavable rock in which the tendency to split is regarded as resulting from long-continued pressure exerted at right angles to the cleavage planes. Slates vary in mineral and in chemical composition. The most common is known as clay slate or argillite. Roofing slate of excellent quality is quarried in Wales and Canada. In the U. S. the principal slate regions are in Pa. and Vt. Its tensile strength is ab.3,000 and its compressive strength 12,000 lbs. per sq. in. During 1896 the value of all the slate produced in the U. S. was $2,728,437, of which Pa. produced two-thirds and Vt. one-fourth.

Slater, SAMUEL, 1768–1835. English machinist, founder of the first successful cotton-spinning mill in U. S., at Pawtucket, R. I., 1790, and later of others in Mass.—His nephew, JOHN FOX, 1815–1884, gave a fund of $1,000,000 in 1882 for the education of freedmen.

Slatin, RUDOLPH, b.1856. Austrian officer, in Africa under Gordon 1878; Pasha 1879, and Gov. of w. Darfur 1880–Dec. 1883, when he was overcome by the Mahdists; held as a slave till Feb. 1895. The story of his battles, captivity, and escape is told in his *Fire and Sword in the Sudan*, tr. 1896.

Slaughter House, or ABATTOIR. Establishment for the slaughtering and preparation of cattle, calves, sheep and lambs for food, so arranged that there shall be no contamination of the atmosphere by injurious or unpleasant emanations. The first was built in Paris in 1807; in 1818 five public abattoirs were built there; also one in Edinburgh 1851 and in London 1855. Since then they have been established in many cities; in the U. S. they are usually owned by private persons. The most elaborate are constructed of brick and iron, and are furnished with machinery and appliances for rapid and humane slaughtering, saving the blood and drying it, chill rooms for cooling the slaughtered animal, and cold storage for the dressed beef. The liver, heart, tongue, tail, fat, hide, hoofs and horns are all prepared for sale. In some places oleomargarine is prepared from the fat and the trimmings are canned for soup. The refuse matter is carefully removed without nuisance. One abattoir in New York has a capacity for slaughtering 5,000 cattle per day and cold storage for 6,500.

Slave Coast, or BENIN COAST. In W. Africa, extending from the Volta R. to the Benin R.; oppressively hot and unhealthy. The slave-trade, which flourished here in former times, has been suppressed. It is under the German, French and British influence. See LAGOS, SENEGAMBIA, and TOGO.

Slavery, IN ECONOMIC HISTORY. Institution in which labor is not a participant in distribution of the products of industry, but itself part of the contribution of the capitalist slave-owner. This arose in the early world's history, as a result of capture in war, and was common to the ancient Oriental nations and Jews, Greeks and Romans. Christianity ameliorated the condition of slaves. The barbarian invaders of the Roman empire brought Slavonian captives with them, hence the word slave. In Britain, Celts were enslaved by the Anglo-Saxons, who also exported the Irish as slaves. With the Norman Conquest, slavery was replaced by serfdom, an ameliorated form of slavery, which prevailed in Europe, and has been gradually abolished. Mohammedans continued to deal in slaves, including Christians, until 1812. Negro slavery existed from ancient times. They were brought from Africa to America by the Portuguese and other colonizers, and were first largely used in Hayti ab.1500. The English brought 300,000 slaves from Africa to their colonies 1680–1700, and 610,000 to Jamaica 1700–86. Up to 1772 negro slaves were also held in England; at that date it was decided by the courts that a slave became free on English soil, but could be reclaimed in his master's country. Slave trade was prohibited by England 1808. Emancipation of slaves took place in Hayti 1791; in the British colonies 1838; in the French colonies and the South American republics 1848; in the Dutch colonies 1863; in Brazil 1888. See SLAVERY IN THE U. S.

Slave Gang in Zanzibar.

Slavery in the U. S. Slavery was a recognized fact in the U. S. from colonial times. In 1776 ab. 300,000 slaves had been imported into the colonies since their settlement. By 1790 this number had increased to 700,000; by 1850 it was over 3,000,000, and in 1861 nearly 4,000,000. The founders of the Republic were mostly opposed to the institution and efforts were made to abolish it. But Ga. and S. C. insisted on its preservation as a condition of their entering the Union, and it remained, although the Constitution refused to recognize it by name, Madison saying that the U. S. "did not choose to admit the right of property in man." The slave question entered into nearly every chapter of the subsequent history of the U. S. until the Civil War. The admission of States, the enactment of laws, even the decisions of courts, were determined by its presence. It was the defense of slavery which at last led to the secession of the Southern States and the outbreak of war. Antagonism to slavery from the humane and moral point of view had increased with great rapidity in the North, the pioneers among the anti-slavery movement being Benj. Lundy, E. P. Lovejoy, Wm. Lloyd Garrison, Wendell Phillips, Chas. Sumner, and others. The sentiment of the North was strongly against slavery at the outbreak of the rebellion, although there was by no means unanimity of opinion as to the wisest way to get rid of it. It had been abolished in all the Northern States in the early days of the Union, begin-

ning with Vt. 1777, and ending with N. J. 1804. The emancipation of the slaves preceded the close of the war. Congress in 1862 passed an act abolishing slavery in the Territories, and in Sept. Pres. Lincoln issued the proclamation of emancipation. In 1864 the constitutional amendment was passed abolishing and forever prohibiting slavery throughout the U. S. Slavery was introduced into Va. 1619, and excluded from N.W. Territory 1787. Importation of slaves was prohibited 1808. The Mo. Compromise was enacted 1821, repealed 1854. The Fugitive Slave Bill was passed 1850, repealed June 13, 1864. The Dred Scott decision was made 1857. Abolition of slavery in District of Columbia April 16, 1862; Lincoln's first emancipation proclamation Sept. 22, 1862; second, Jan. 1, 1863. The abolition of slavery was officially proclaimed Dec. 18, 1865.

Slavonia. Province of Austria-Hungary, now forming with CROATIA (q.v.) the province of Croatia-Slavonia. It occupies the whole of the angle between the Drave and Save Rivers and, on the Save, forms the n. boundary of Servia.

Slavonic (or SLAVIC) **Languages.** Russian and Ruthenian (or Little Russian); Bulgarian, Servian, and Kroatian; Polish, Bohemian, and Moravian, with other dialects. The Old Bulgarian, into which Cyril translated the Bible ab.1000, was adopted as the sacred language of the Greek Church. Besides Russian, now growing in importance, the Servian is important for its ballads, to which J. Grimm called attention in an appreciative review.

Slavs, or SLAVONIANS. Branch of the Aryan family, first known about the Carpathian Mts. To this stock belong the Russians, Bulgarians, Illyrians, Lechs (including Poles, Siberians, and Pomeranians), Bohemians, and Polabians, or Slavic tribes of n. Germany.

Sleep. State of rest of the intellectual and voluntary activities of the body manifested by the cessation of the automatic activity of the brain. The physical basis is not definitely determined. It is possibly an example of the vital cycle of function, where rest follows activity, as seen in the more rapid sequences of the heart. See DREAMING.

Sleeper. Piece of timber laid upon the earth and supporting other timbers or railroad track; in England, CROSS-TIE (q.v.) of a railroad track.

Sleeping Table. Stationary ore-dressing apparatus, similar to the BUDDLE (q.v.) in principle, but worked by hand.

Sleep of Plants. Many flowers close in the night, and the leaves also fold up. Some flowers are open a portion of the day, as with the Crocus, in the morning; some are open in the night only, as the Night-blooming Cereus, a species of Cactus. The closing of plants protects the sensitive parts from cooling and wetting.

Sleidan, or **Philippsohn,** JOHANNES, 1506–1556. German historian of Charles V. and the Reformation. This work, *De Statu Religionis*, 1553–56, tr. 1560, was widely read, as was his book on ancient Babylon, Persia, Greece, and Rome, 1556, tr. 1627 as *Key of History*.

Sleigh. Vehicle on runners, used in all countries where snow lies on the ground for any considerable part of the year. There are many forms, the low variety being used for heavy loads. They are also used in some warm countries. Pictures of sleighs are found on Egyptian sculptured work.

Slemmer, ADAM J., U.S.A., 1828–1868. Brig.-gen. U. S. Vols. 1862; disabled at Stone River.

Sleswick. See SCHLESWIG.

Slickensides. Smooth polished or striated surface, frequently seen in regions where the rocks have been much disturbed by geological causes; produced by the rubbing of one rock mass upon another under great pressure.

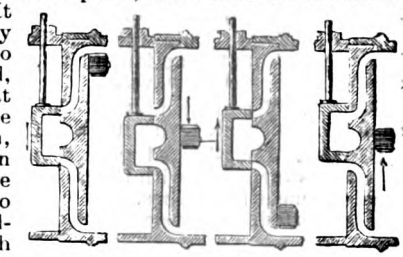
Slide, or SLIP. In Mining, nearly identical with Fault.

Slide Joint. Mechanical device to limit the effects of the concussion when the drill strikes the rock. See JAR.

Slidell, JOHN, 1793–1871. M.C. from La. 1843–45, U.S. Senator 1853–61; Commissioner C.S.A. to France with James M. Mason 1861; arrested on a British vessel Nov. 8, 1861, by CAPT. C. WILKES (q.v.), but soon released on demand of England.

Slide Rule. Instrument for making rough multiplications and divisions, the principle being that of logarithms.

Slide Valve. Most usual form of valve for distributing steam to the two ends of the engine cylinder, and allowing its escape at and through the proper interval. Devised by James Watt. In the surface upon which the valve slides are three (or more) openings, called ports. The two extreme ones communicate respectively with the two ends of the cylinder beyond the travel of the piston; the central one communicates with the open air or with the condenser to which exhausted steam is delivered. The simple valve without lap (see LAP) just covers the outer edges of the outer ports; on its under side is a cavity whose length equals the distance between the inner edges of the steam ports, and whose breadth is the length of the ports. It will be seen that any motion of the valve to admit steam to one end, when the piston is at that end, and the valve in its central position, is accompanied by an opening of the passage from the other end into the cavity which is always in connection with the exhaust port. This kind is called a D valve, and has been moving to open the port in the opposite direction to that of the last motion of the piston; in pumps it is often desirable to have the valve open by a motion in the same direction as the previous piston stroke, and the valve is called a B valve from its resemblance in section to a letter ɑ on its side, there being two cavities. In the ALLEN VALVE (q.v.) steam comes also over a passage in the shell over the cavity into the port, as well as at the end. To shorten the passages for steam, the valve is often separated into two parts coupled by a rod, so that the steam ports are short for conduction of heat, but the exhaust passage is long. To enable an early cut-off to be attained without impeding or disarranging exhaust, one valve slides on back of another, the upper cutting off admission to ports made in the lower valve, which carries the exhaust cavity, and releases and compresses exhaust steam at proper and fixed points. The slide valve may be driven by an eccentric or crank directly, or through a rock-shaft, or through a link-motion, or by cams. See ADJUSTABLE CUT-OFF, BALANCED VALVES, GRIDIRON VALVE, and LINK-MOTION.



Positions of a Slide Valve.

Sliding Friction. That arising when one surface slides upon another. This is greatest at the moment when motion begins.

Slimes. In ore dressing, particles of ore and rock that get reduced to a condition of great fineness and are easily carried along in a slowly moving current of water.

Slime Table. Ore-dressing apparatus devised for separating and saving the more valuable portions in the slimes, as they are carried in water over the surface of the table.

Sline, or SLYNE. The CLEAT (q.v.).

Sling. Small piece of leather, pierced and held by cords, whereby stones were hurled; weapon much used in ancient times, as by David against Goliath (I. Sam. xvii.), and till firearms came into use.

Slip. See SLIDE.

Slipper Flower. Shrubs of the genus *Calceolaria*, natural family *Scrophulariaceæ*, natives of the Andes of S. America; much cultivated for ornament.

Slit. Narrow opening in one end of the collimating telescope, which in a spectroscope or spectrometer serves to render parallel the rays falling on the prism or grating.

Sloan, SAMUEL, b. 1817 in Ireland. Pres. Hudson River R. R. 1855–62; pres. Delaware, Lackawanna, and Western R. R. since 1867.

Sloane, SIR HANS, F.R.S., 1660–1753. Irish naturalist; Baronet 1716; royal physician 1727. His library and collections formed the beginning of the British Museum. *Natural History of Jamaica*, 1707–25.

Sloane, WILLIAM MILLIGAN, b.1850. Prof. of History at Princeton since 1883. *Life of Napoleon*, 1896.

Sloat, JOHN DRAKE, U.S.N., 1780–1867. Captain 1837, Commodore 1862, Rear-admiral 1866. He occupied San Francisco and parts of Cal. 1846.

Slocum, HENRY WARNER, U.S.A., 1827–1894. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862, serving in Va., Tenn., and Ga.; prominent at Gettysburg; M.C. from N. Y. 1869–73 and 1885–87.

Sloe. See BLACKTHORN.

Slope OF A PLANE CURVE. Trigonometrical tangent of the inclination at a given point: its differential expression when the locus is referred to rectangular co-ordinates is $\frac{dy}{dx}$.

Slope. See INCLINE.

Slope. Angle between an inclined surface and a horizontal plane. A slope of 2 to 1 is such that its horizontal projection is double that of the vertical rise. The slope necessary for the flow of water in a channel is very slight, and is usually expressed by the ratio of the vertical fall to the horizontal distance.

Slope Level. Small level to which is attached a gradu-

ated arc; used for finding the slope of the surface of ground, this being expressed by the number of degrees in the angle it makes with the horizontal. See CLINOMETER.

Slope Wall. Thin wall used to protect the slopes of embankments from the action of rain, or the sides of the bed of a canal from that of waves.

Sloop. Vessel with a single mast, resembling a cutter and sometimes identified with it. See CUTTER.

Sloths. Long-legged gray edentates of S. America, with 2 or 3 toes furnished with long, hooked claws, for walking suspended beneath branches. They rarely descend to earth; the tail is aborted. They sleep, hanging to a limb. They feed on

Two-toed Sloth (*Cholœpus didactylus*).

leaves; their voice is a grunt. Their alimentary canal is simple, not divided into large and small sections. One young is born at a time. In *Cholœpus didactylus*, only digits 2 and 3 are present. It can turn its head easily: its stomach has 4 divisions, somewhat as in herbivora. See BRADYPODIDÆ.

Slotter. Machine-tool in which the cutting tool reciprocates vertically, while the work is held upon the table which receives the feed-motions. It is a vertical shaper (see SHAPER), and the work-table has lateral, longitudinal, and circular feed-motions. It gets its name from its special adaptation to cutting slots or key-ways in work chucked to the table. The tool slide in smaller machines is driven by a Whitworth quick-return motion (see QUICK-RETURN). Larger ones are often driven by toothed gearing, driving a rack on the slide.

Slovaks. Slavic people in n.w. Hungary, inhabiting the valleys of the Waag, Gran, Taracz and Topla, numbering ab.

Slovak Maiden.

2,000,000. They are also met with about Budapest and in the e. of Moravia. Efforts have been made to create a pure Slovak literature, but they have met considerable opposition from the Hungarians and Bohemians. Their language is a dialect of Czech, and has a recent literature, in the 19th century.

Slovenians. Slavic people in Styria, Carniola, Carinthia, and w. Hungary, numbering ab.1,300,000. Their language is probably the oldest of the Slavonic tongues, but its literature is chiefly of recent development, near the end of the 18th century.

Slow Match. See MATCH.

Slows. MILKSICKNESS (q.v.) in cattle.

Sloyd. Method of manual training originated in Finland, prevalent in Sweden, and largely adopted elsewhere; certain artisan work is taught as a matter of discipline.

Sludge. Pulverized rock that accumulates in the bottom of a hole in the operation of drilling.—Also the black compound of sulphuric acid and hydrocarbons, which separates in the refining of petroleum. About half the acid is recovered by dilution with water and evaporation, the residual tarry matter settling out.

Slugs. See STYLOMMATOPHORA.

Sluice. Culvert or trough for carrying water, or for conveying water away from a water wheel.—In Placer Mining, long, narrow, and shallow trough, or series of troughs, with rough flat bottoms, sometimes paved with stone, through which a current of water carries the auriferous sands and gravels, and in which the gold is saved with the help of quicksilver. In the hydraulic mines of Cal. sluices hundreds or thousands of ft. in length have been built.

Slums. In Mining, (1) slimes; (2) soft clayey coal-beds.

Sluys. Town of E. Flanders, 6 m. n.e. of Bruges. Near it Edward III. of England gained a signal naval victory over the French, June 24, 1340; 230 French ships were taken, and 25,000 men slain. It was taken by the Spaniards 1587, and by Prince Maurice 1604. Pop. ab.2,800.

Smalkaldic League. Treaty of defensive alliance between the Protestant princes of Germany; formed at Smalkald in Hesse, and concluded at Frankfort, Dec. 31, 1530.

Small Arms. The portable firearms used by troops; namely, muskets, carbines, pistols and revolvers.

Small Debts. In Scotland, debts under £12, recoverable in the Sheriff's Court.

Smalley, GEORGE WASHBURN, b.1833 in Mass. London correspondent of N. Y. *Tribune* 1867–95; New York correspondent of London *Times* 1895. *Studies of Men*, 1895.

Smalley, JOHN, D.D., 1734–1820. Pastor at New Britain, Conn., 1758–1813; prominent preacher and theologian. *Inability*, 1769.

Small Fruits. Fruits which grow upon bushes, as strawberries, currants, blackberries and gooseberries. Grapes, cherries, and mulberries are improperly classed with small fruits. With the exception of the strawberry, the term corresponds to the English Bush fruits.

Smallpox. Acute, infectious, eruptive fever. One of the most virulent of contagious diseases which, before the introduction of vaccination, decimated the race. The contagium, which has not been isolated, exists in the secretions, excretions and exhalations from the lungs and skin, but is most marked in the dust-like powder of the dried scales from the eruption. Vaccination is the great prophylactic. Complete isolation and thorough disinfection is necessary in the proper treatment of every case. See VACCINATION.

Smallwood, CHARLES, 1812–1873. Prof. of Meteorology in McGill Coll. from 1858, and later also of Astronomy; contributor to Smithsonian *Reports*.

Smallwood, WILLIAM, 1732–1792. Col. of Md. troops 1776; active at Brooklyn and White Plains; Brig.-gen. Oct. 1776; distinguished at Germantown and Camden, S. C.; Major.-gen. 1780; Gov. of Md. 1785–88.

Smalt. Dark-blue glass made by fusing quartz, potassium carbonate, and a compound of cobalt. When finely powdered, it is used as a pigment.

Smaltite. $CoAs_2$. Mineral compound of cobalt and arsenic, in which the cobalt is usually replaced to a greater or less extent by nickel and iron. It is one of the raw materials used in the manufacture of smalt and other preparations of cobalt. There are extensive works in Saxony, utilizing the ores found there.

Smaragdite. Light green variety of the mineral amphibole, found associated with saussurite in the rock known as euphotide.

Smart, BENJAMIN HUMPHREY, ab.1785–ab.1872. English grammarian and lexicographer. *Metaphysics*, 1831–39; *Dictionary*, 1836.

Smart, CHRISTOPHER, 1722–1770. English poet, tr. of Horace, 1756, and the Psalms, 1765. His best piece, *Song to David*, 1763, was produced in a madhouse.

Smart, HENRY, 1813–1879. English composer. His cantata, *The Bride of Dunkerron*, written for the Birmingham Festival, 1864, is popular, because melodious and easy for choristers.

Smartweed. *Polygonum hydropiper.* Acrid herb of the natural family *Polygonaceæ*, native of Europe, introduced as a weed into America; also called Water-pepper. Various species of the genus *Polygonum*, and this especially, are occasionally bad weeds in cultivated ground. They succumb easily to careful and thorough culture.

Smeaton, JOHN, 1724–1792. English civil engineer; builder of the Eddystone lighthouse 1756–59, the greatest work of its

John Smeaton.

kind till the erection of a new lighthouse near by 1879; and of the Forth and Clyde canal; first to use the diving-bell. His professional reports were published in 3 vols. 1779.

Smectite. Clay-like mineral of greenish color, allied in composition to fuller's earth.

Smectymnuus. Name affixed to *An Answer*, 1641, to Bp. Hall's defense of Episcopacy, 1640; formed from the initials of the authors, S. Marshall, E. Carbamy, T. Young (Milton's tutor), M. Newcomen, and W. Spurstow.

Smedes, SUSAN (DABNEY), b.1840. American author of *Memorials of a Southern Planter*, 1887.

Smedley, FRANCIS EDWARD, 1818–1864. English novelist. *Frank Fairleigh*, 1850; *Lewis Arundel*, 1852; *Harry Coverdale's Courtship*, 1854.

Smell, SENSATIONS OF. Those aroused by stimulation of the olfactory cells of the upper third of the nose, the excitement being carried to the brain by the olfactory nerve; they are sharply differentiated from all the special senses except taste and the tactile sense; confused with taste in the case of flavors, and with tactile sense in that of such stimuli as ammonia fumes. The variety of odors is very great, and no analysis and classification can be made. The physical condition of smell is that the odorous substance exist in an extremely fine state of subdivision, and be driven against the olfactory mucous membrane of the nose. This latter mechanical process is ordinarily carried out by breathing or sniffing.

Smelling Salts. Restoratives used by persons suffering from faintness. See SAL VOLATILE.

Smelting. Process of melting or fusing ores for the purpose of extracting the metal. See COPPER, IRON, and FURNACES.

Smelts. Isospondylous fishes of the genus *Osmerus*. These are small fishes, with toothed mouth, sometimes erroneously called Frost-fish. They are closely related to the salmon, and are anadromous in habit, spawning in the headwaters of rivers late in fall.

Smendes. See HER-HOR.

Smerdis. Brother and victim of Cambyses; personated by an impostor, who gained the Persian throne 521 B.C.

Smeru, or SEMERU. Highest mountain of Java, on the e. end of the island, an active volcano. Altitude 12,030 ft.

Smetana, FRIEDRICH, 1824–1884. Bohemian pianist and composer; one of the founders of the Bohemian school. He wrote eight operas on national subjects, besides symphonic poems and chamber music. An enthusiastic interest in Czechish music, especially his own, has been lately aroused by performances of his opera *Married for Money*.

Smet, PETER JOHN DE, 1801–1872. Belgian Jesuit, missionary among the western Indians from 1838. *Rocky Mountains*, 1843–47.

Smift. Form of slow match, used by miners in firing blasts.

Smilax. 1. Genus of climbing woody plants of the Lily family, of wide geographical distribution. 2. *Myrsiphyllum asparagoides*, herbaceous vine of the same family, much cultivated for ornament.

Smiles, SAMUEL, LL.D., b.1812. Scottish author. *Self-Help*, 1859; *Lives of Engineers*, 4 vols., 1861–65; *Huguenots*, 1867–73; *Character*, 1871; *Thrift*, 1875; *Duty*, 1880; and several biographies.

Smillie, JAMES, 1807–1885. N.A. 1851. American landscape engraver. His principal plates are after Cole's *Voyage of Life*, Bierstadt's *Rocky Mountains*, and Kensett's *Mt. Washington*.—His sons, JAMES DAVID, b.1833, N.A. 1876, and GEORGE HENRY, b.1840, N.A. 1882, are noted painters.

Smirke, ROBERT, 1752–1845. English painter and illustrator, R.A. 1791.—His son, SIR ROBERT, 1780–1867, architect, R.A. 1811, knighted 1831, built Covent Garden Theater 1809, and most of the British Museum (1823–27), which was completed by his brother, SYDNEY, 1799–1877, R.A. 1860.

Smith, ADAM, LL.D., 1723–1790. Father of modern political economy; Prof. of Logic Univ. Glasgow 1751, and of Moral

Adam Smith.

Philosophy 1752–63. *Theory of Moral Sentiments*, 1759. His *Wealth of Nations*, 1776, was the fruit of long study, and is still of high importance. *Works*, 5 vols., 1811–12.

Smith, ALBERT, 1816–1860. English novelist. *Mr. Ledbury*, 1844; *Pottleton Legacy*, 1849.

Smith, ALEXANDER, 1830–1867. Scottish poet, essayist, and novelist. *Life Drama*, 1851; *Edwin of Deira*, 1861; *Dreamthorp*, 1863; *A Summer in Skye*, 1865; *Alfred Hagart's Household*, 1866; *Miss Oona McQuarrie*, 1866.

Smith, ANDREW JACKSON, U.S.A., b.1815. Brig.-gen. U. S. Vols. 1862–66; active at Vicksburg, on Red River, in Mo., and at Nashville.

Smith, ARCHIBALD CARY, b.1837. American naval architect.

Smith, ASA DODGE, D.D., LL.D., 1804–1877. Pres. Dartmouth Coll. from 1863.

Smith, BUCKINGHAM, 1810–1871. American antiquarian. His researches chiefly related to the early history of Mexico and Florida.

Smith, CALEB BLOOD, 1808–1864. M.C. from Ind. 1843–49; Sec. Interior 1861–62.

Smith, CHARLES EMORY, b.1842. Ed. Albany *Journal* 1870, and Phila. *Press* since 1880; U. S. Minister to Russia 1890–92.

Smith, CHARLES FERGUSON, U.S.A., 1807–1862. Brig.-gen. U. S. Vols. 1861; distinguished at Fort Donelson, Tenn.; Major-gen. 1862.

Smith, CHARLES HENRY ("BILL ARP"), b.1826. Humorist of Georgia.

Smith, CHARLES SHALER, 1836–1886. Civil engineer, builder of four bridges over the Mississippi and many elsewhere.

Smith, DAVID M., 1809–1881. American inventor.

Smith, DONALDSON, M.D., b. 1864. American traveler. *Through Unknown African Countries*, 1897.

Smith, EDMUND KIRBY, 1824–1893. Brig.-gen. and Major-gen. C.S.A. 1861, Lieut.-gen. 1862, General 1864; active in Ky., Tenn., and on Red River; chancellor Univ. Nashville 1870–75; prof. at Sewanee, Tenn., from 1875.

Smith, ELI, 1801–1857. American missionary in Syria 1827; Palestinian explorer, with Dr. E. Robinson, 1838 and 1852. *Researches in Armenia*, 1833.

Smith, ELIZABETH OAKES. See SMITH, SEBA.

Smith, ERMINNIE ADELLE (PLATT), 1836–1886. Ethnologist, working for the Smithsonian Institution.

Smith, EUGENE ALLEN, b. 1841. Asst. State Geologist of Mo. 1868–71; State Geologist of Ala. since 1873; prof. Univ. Ala. from 1871. *Reports*, 1874 and later.

Smith, FRANCIS HENNEY, LL.D., 1812–1890. Prof. Va. Military Institute 1839–89; author of mathematical text-books.

Smith, FRANCIS HOPKINSON, b.1838. American artist and author. *Well-Worn Roads*, 1886; *Tile Club*, 1887; *Colonel Carter of Cartersville*, 1891; *Tom Grogan*, 1896.

Smith, FRANCIS OSMOND, 1806–1876. M.C. from Me. 1833–39; promoter of the Morse telegraph. *Laws of Maine*, 1834.

Smith, SIR FRANCIS PETTIT, 1808–1874. English inventor of screw-steamers 1834; knighted 1871.

Smith, GEORGE, 1840–1876. English Assyriologist; in British Museum 1867; sent to Nineveh 1872–73, where he made important discoveries and collections. *Assyria*, 1875; *Hist. Babylonia*, 1877.

Smith, GEORGE WILLIAMSON, D.D., b.1836. Pres. Trinity Coll., Hartford, Conn., since 1883.

Smith, GERRIT, 1797–1874. Reformer, active against slavery; M.C. from N. Y. 1853–55. *Speeches*, 1855–61; *Theologies*, 1866.

Smith, GOLDWIN, LL.D., D.C.L., b.1823. Prof. Oxford 1858–66, Cornell 1868–71; at Toronto since 1871; prolific writer, chiefly on history; biographer of Cowper, 1880, Jane Austen, 1890, and others. *Hist. U. S.*, 1893.

Smith, GREEN CLAY, 1830–1895. Brig.-gen. U. S. Vols. 1862–63; M.C. from Ky. 1863–66; Gov. of Montana 1866–69; Prohibition candidate for Pres. 1876.

Smith, GUSTAVUS WOODSON, 1822–1896. Major-gen. C.S.A. 1861–65.

Smith, HANNAH ("HESBA STRETTON"). English novelist and writer of juvenile tales. *Paul's Courtship*, 1867; *Bede's Charity*, 1882.

Smith, HENRY BOYNTON, D.D., LL.D., 1815–1877. Prof. Union Theol. Sem., N. Y., 1850–74; ed. *American Theol. Review* 1862–71. *Apologetics*, 1882; *Systematic Theology*, 1884.

Smith, SIR HENRY GEORGE WAKELYN, 1788–1860. English general, active in India 1839–46; knighted 1844, Baronet 1846; in S. Africa 1834–35 and 1847–53.

Smith, HENRY HOLLINGSWORTH, M.D., b.1815. Prof. Univ. Pa. 1855–71. *Surgery*, 1852, '57, '63.—His cousin, FRANCIS GURNEY, M.D., 1818–1878, was prof. Univ. Pa. 1863–77, and ed. sundry medical books.

Smith, HENRY JOHN STEPHEN, 1826–1883. Prof. of Geometry at Oxford 1861. He wrote largely on the Theory of Numbers, received the Steiner Prize in Berlin 1868, and the Grand Prize of the French Academy 1883.

Smith, HOKE, b.1855. Ed. Atlanta *Journal* 1887; Sec. Interior 1893–96.

Smith, HORACE, 1779–1849. London stockbroker, author of many forgotten novels, and with his brother JAMES, 1775–1839, of *Rejected Addresses*, 1812, the most famous book of English parodies.

Smith, HORACE, 1809–1893. American inventor.

Smith, ISRAEL, 1759–1810. M.C. 1791–97; U. S. Senator 1803–7; Gov. of Vt. 1807–8.

Smith, JAMES, ab.1720–1806. Delegate to Congress from Pa. 1776–78; signer of the Declaration of Independence.

Smith, JAMES, b.1851. U. S. Senator from N. J. 1893.

Smith, JAMES EDWARD, 1759–1828. Pres. Linnæan Society in London. *Flora Britannica*, 1800–4; *Physiological and Systematical Botany*, 1807; *English Flora*, 1824–36.

Smith, JAMES MILTON, b.1823. Confederate M.C. 1862–65; Gov. of Ga. 1872–74.

Smith, JAMES YOUNGS, 1809–1876. Gov. of R. I. 1863–65.

Smith, JEREMIAH, 1759–1842. M.C. 1791–97; Chief-justice of N. H. 1802–9 and 1813–16; Gov. 1809–10.

Smith, JEROME VAN CROWNINSHIELD, M.D., 1800–1879. Ed. Boston *Medical Journal* 1828–56; prof. New York Medical Coll. 1859.

Smith, JOHN, 1579–1631. English adventurer, prominent in the early history of Va. 1606–9. He made voyages to New

John Smith.

England 1614–15. *True Religion*, 1608; *New England*, 1616; *Hist. Va.*, 1624; *Travels*, 1630. The story of his deliverance by Pocahontas is probably fabulous.

Smith, JOHN, 1616–1652. Cambridge Platonist, esteemed by Matthew Arnold the ablest of that eminent band. *Select Discourses*, 1660.

Smith, JOHN COTTON, LL.D., 1765–1845. M.C. 1801–7; Judge of Conn. Supreme Court 1809; Gov. 1813–18.

Smith, JOHN EUGENE, b.1816. Brig.-gen. U. S. Vols. 1862–65, serving in Tenn. and under Sherman; Col. U.S.A. 1866–81.

Smith, JOHN GREGORY, LL.D., 1818–1891. Gov. of Vt. 1863–65.

Smith, JOHN LAWRENCE, M.D., 1818–1883. Prof. Univ. Va. 1852–54, and at Louisville 1854–66; investigator of meteorites. *Mineralogy and Chemistry*, 1873.

Smith, JOHN PYE, F.R.S., 1774–1851. Teacher in theol. sem. at Homerton, England, 1800–50. *Scripture and Geology*, 1839.

Smith, JOHN WILLIAM, 1809–1845. Irish lawyer and writer. *Mercantile Law*, 1834; *Leading Cases*, 1837–40.

Smith, JONATHAN BAYARD, 1742–1812. Delegate to Congress 1777–78; judge of Pa. courts 1778.

Smith, JOSEPH, U.S.N., 1790–1877. Captain 1837, Rear-admiral 1862.

Smith, JOSEPH, 1805–1844. Mormon prophet; b. in Sharon, Vt., removed to Palmyra, N. Y., 1815. In 1827 he received, as he said, from an angel, a book written in strange characters on golden plates. This *Book of Mormon* he tr. by the aid of

magical spectacles, and pub. 1830. He and his followers removed 1831 to Kirtland, Ohio, 1838 to Mo., and 1840 to Ill., where he founded NAUVOO (q.v.). Here in 1843 he claimed to have received a revelation authorizing polygamy. A paper was started to oppose his teachings: its plant was destroyed by his disciples. He and his brother Hyrum were arrested and lodged in the county jail, where they were both shot by a mob. —His son, JOSEPH, b.1832, became the head of a reorganized ch. 1860.

Smith, JOSEPH MATHER, M.D., 1789–1866. Prof. New York Coll. of Physicians from 1826. *Epidemics*, 1824; *Hygiene*, 1850.

Smith, JOSHUA TOULMIN, 1816–1869. English antiquarian, in America 1837–42. *Northmen in New England*, 1839; *The Parish*, 1854; *Hist. English Guilds*, 1870.

Smith, JUDSON, D.D., b.1837. Prof. Oberlin 1866–84; ed. *Bibliotheca Sacra* 1882–84; foreign sec. A.B.C.F.M. since 1884. *Ch. History*, 1881.

Smith, JUNIUS, LL.D., 1780–1853. Lawyer and merchant of Conn.; founder British and American Steam Navigation Co. 1836.

Smith, MATTHEW HALE, 1816–1879. American writer for (1836) and against (1842–47) Universalism.

Smith, MELANCTON, U.S.N., 1810–1893. Commander 1855, Captain 1862; distinguished on the Gulf of Mexico and on the Mississippi; Commodore 1866, Rear-admiral 1870.—His grandfather, MELANCTON, 1724–1798, was in Congress 1785–88, and prominent in N. Y. affairs.

Smith, MERIWETHER, 1730–1790. Delegate to Congress 1778–82; supposed author Va. Bill of Rights.

Smith, MORGAN LEWIS, 1822–1874. Brig.-gen. U. S. Vols. 1862–65.—His brother, GILES ALEXANDER, 1829–1876, was Brig.-gen. 1863–65, and Major-gen. 1865–66. Both served in Tenn. and Ga.

Smith, NATHAN, M.D., 1762–1828. Prof. Dartmouth from 1798; eminent as a surgeon. *Medical Memoirs*, 1831.—His son, NATHAN RYNO, M.D., 1797–1877, was prof. Univ. Md. 1827–28 and 1840–70. *Anatomy of the Arteries*, 1832–35; *Fractures*, 1867.—His son, ALAN PENNEMAN, M.D., b.1840, prof. Univ. Md. since 1868, is a noted lithotomist.

Smith, NATHANIEL, 1762–1822. M.C. 1795–99; Justice Conn. Supreme Court 1806–19; leader in Hartford Convention 1814.—His brother, NATHAN, 1769–1835, was U. S. Senator from 1832. —Their nephew, TRUMAN, 1791–1884, was M.C. from Conn. 1839–49, and U. S. Senator 1849–54. *Anæsthesia*, 1859—A relative, PERRY, 1783–1852, was U. S. Senator 1837–43.

Smith, PERSIFOR FRAZER, 1798–1858. Brig.-gen. U.S.A. 1856; distinguished in the war with Mexico.—His cousin and namesake, 1808–1882, pub. *Reports of Pa. Supreme Court*, 32 vols., 1865–82.

Smith, PRESTON, 1823–1863. Brig.-gen. C.S.A. 1862.

Smith, RICHARD, b.1823 in Ireland. Ed. Cincinnati *Gazette* from ab.1857.

Smith, RICHARD PENN, 1799–1854. Grandson of Dr. Wm.; dramatist; biographer of Van Buren and Crockett, 1836.

Smith, RICHARD SOMERS, 1813–1877. Pres. Girard Coll., Phila., 1863–68; pres. U. S. Naval Academy from 1870. *Topographical Drawing*, 1854; *Linear Perspective*, 1857.

Smith, RICHMOND MAYO, b.1854. Prof. Columbia since 1883. *Economics*, 1888; *Emigration*, 1890.

Smith, ROBERT, 1689–1768. Prof. Cambridge 1716; master Trinity Coll. 1742; founder of prizes there. *Optics*, 1738; *Harmonics*, 1748.

Smith, ROBERT BARNWELL. Original name of RHETT, R. B. (q.v.).

Smith, ROBERT PAYNE, D.D., b.1818. Prof. Oxford 1865; Dean of Canterbury 1871; O. T. reviser; commentator. *Isaiah*, 1862; *Prophecy*, 1865.

Smith, ROSWELL, 1829–1892. Founder, in connection with J. G. Holland and C. Scribner, of *Scribner's Mag.* 1870–81, which became the *Century Mag.* 1881, and of *St. Nicholas*, 1873; pres. Century Co.

Smith, SAMUEL, 1752–1839. Revolutionary officer 1776–79; defender of Fort Mifflin 1777, and of Baltimore 1814; M.C. from Md. 1793–1803 and 1815–22; U. S. Senator 1803–15 and 1822–33; Mayor of Baltimore 1835–38.—His brother, ROBERT, 1757–1842, was Sec. of the Navy 1802–5, Atty.-gen. 1805, and Sec. of State 1809–11.

Smith, SAMUEL EMERSON, 1788–1860. Judge of Me. courts 1821–30 and 1835–37; Gov. 1831–34.

Smith, SAMUEL FRANCIS, D.D., 1808–1895. American Baptist, author of "My country 'tis of thee," 1832, and many hymns.

Smith, SAMUEL STANHOPE, D.D., LL.D., 1750–1819. Prof. Princeton 1779, pres. 1795–1812. *Evidences*, 1809; *Moral and Political Philosophy*, 1812.

Smith, SEBA, 1792–1868. American humorist. *Letters of Major Jack Downing*, 1833.—His wife, ELIZABETH OAKES (PRINCE), 1806–1893, wrote much in prose and verse.

Smith, SOLOMON FRANKLIN, 1801–1869. American comedian. —His son, MARCUS, 1829–1874, played with Wallack and Edwin Booth.

Smith, SOPHIA, 1796–1870. Founder of SMITH COLLEGE (q.v.).

Smith, STEPHEN, M.D., b.1823. Prof. Bellevue 1861, and Univ. N. Y. 1874; founder Health Association 1872; N. Y. Commissioner of Lunacy 1882–88. *Operative Surgery*, 1879.

Smith, SYDNEY, 1771–1845. English Divine, first ed. *Edinburgh Review*, 1802–3, and long a contributor; canon of St. Paul's 1831; famous chiefly for wit. His *Letters of Peter Plymley*, 1807–8, opened the way for Catholic emancipation. *Moral Philosophy*, 1850.

Smith, WALTER CHALMERS, b.1824. Scottish divine and poet. *Olrig Grange*, 1872; *Raban*, 1880; *Kildrostan*, 1884; *A Heretic*, 1890.

Smith, WILLIAM, 1697–1769. Councilor in N. Y. 1763–67; judge from 1763.—His son, WILLIAM, 1728–1793, became Chief-justice of N. Y. 1763, Councilor 1767, and was Chief-justice of Canada from 1786. *Laws of N. Y.*, 1762; *Hist. of N. Y.*, 1793. —His son, WILLIAM, 1769–1847, pub. *Hist. of Canada*, 1815.

Smith, WILLIAM, D.D., 1727–1803. Teacher at Phila. 1752, and in Md. 1780; elected Bp. of Md. 1783, but not consecrated; provost of Phila. Coll. 1789; framer of the "Proposed Book" (liturgical) 1786.—His half-brother, THOMAS, 1745–1809, was in Congress 1780–82, and Judge Pa. Supreme Court from 1794.—His cousin, WILLIAM, 1754–1821, taught in New York and Conn., and prepared the Office of Institution in the Prayer Book, 1804–8.

Smith, WILLIAM, 1730–1814. Delegate to Congress from Md. 1777–78; M.C. 1789–91.

Smith, WILLIAM, 1762–1840. M.C. from S. C. 1797–99; judge 1799–1816; U. S. Senator 1817–23 and 1826–29.

Smith, WILLIAM, 1769–1839. English surveyor, who in 1790 pub. a *Tabular View of the Strata*, in which he proposed a classification of the secondary formations in w. England. In 1815 he completed a geological map of England, in which he succeeded in throwing the whole complicated series of British strata into natural order. He is hence called the Father of English Geology.

Smith, WILLIAM ("EXTRA BILLY"), 1796–1887. M.C. 1841–43 and 1853–61; Gov. of Va. 1846–49 and 1863–65; Brig.-gen. C.S.A. 1862–63.

Smith, WILLIAM, U.S.N., 1803–1873. Commander 1854, Commodore 1862, serving in Va. and Fla.

Smith, SIR WILLIAM, D.C.L., 1813–1893. Prof. New Coll., London; knighted 1892. He edited important dictionaries of *Greek and Roman Antiquities*, 1840–42; *Biography and Mythology*, 1843–49, and *Geography*, 1853–57; of the *Bible*, 1860–63; of *Christian Antiquities*, 1875–80, and of *Christian Biography, Literature, Sects, and Doctrines to 800*, with Dr. Wace, 1877–87; of *Latin*, 1855–70; besides sundry students' manuals of history, and *The Quarterly Review* from 1867.

Smith, WILLIAM ANDREW, D.D., 1802–1870. Pres. Randolph-Macon Coll., Va., 1846–66; author of a defense of slavery 1857.

Smith, WILLIAM FARRAR ("BALDY"), U.S.A., b.1824. Brig.-gen. U. S. Vols. 1861, Major-gen. 1864–65, serving in Va., Md., and Tenn.; pres. New York Police Commission 1875–81.

Smith, WILLIAM HENRY, D.C.L., 1824–1891. Head of a great firm of news agents and booksellers; M.P. from 1868; Sec. Treasury 1874–77; Lord of Admiralty 1877–80; Sec. for War 1885; First Lord of the Treasury and leader of the Commons from 1887.

Smith, WILLIAM HENRY, 1833–1896. American journalist; manager Associated Press 1883–93. *St. Clair Papers*, 1882.

Smith, WILLIAM LOUGHTON, 1758–1812. M.C. from S. C. 1789–97; Minister to Portugal 1797–1800, and to Spain 1800–1; Federalist writer.

Smith, WILLIAM NATHAN HARRELL, 1812–1889. M.C. 1859–61; in Confederate Congress 1861–65; Chief-justice of N. C. from 1878.

Smith, WILLIAM ROBERTSON, D.D., LL.D., 1846–1894. Prof. Free Ch. Coll., Aberdeen, 1870–81, and Cambridge from 1883; ed. *Encyclopedia Britannica* 1881–88; biblical critic of highest rank. *O. T. in Jewish Ch.*, 1881; *Prophets of Israel*, 1882; *Religion of the Semites*, 1889.

Smith, WILLIAM RUSSELL, 1813–1896. M.C. 1851–57; in Confederate Congress 1861–65; pres. Univ. Ala. *Ala. Reports*, 1862.

Smith, SIR WILLIAM SIDNEY, R.N., 1764–1840. Defender of Acre when besieged by Bonaparte 1799; destroyer of a Turkish fleet at Abydos 1807; Admiral 1805, '10, '21; knighted 1815.

Smith, WILLIAM SOOY, b.1830. Civil engineer; Brig.-gen. U. S. Vols. 1862–64; builder of many bridges in the West.

Smith College. At Northampton, Mass., for women; founded 1871, opened 1875. It has a teaching staff of 40, ab. 850 students, and a library fund of $300,000. To the usual classical, literary, and scientific courses it adds schools of music and art.

Smithfield. In London; cattle-market till 1855; now a hay-market and garden; scene of many beheadings and burnings till 1612, especially of the Protestant martyrs under Mary.

Smithson, JAMES, F.R.S., ab.1754–1829. English scientist, devoted to chemistry and mineralogy; founder of the Smithsonian Institution by a bequest which realized $541,379.63 to the U. S. government.

James Smithson.

Smithsonian Institution. At Washington; established 1846, "for the increase and diffusion of knowledge among men," by use of the bequest of JAMES SMITHSON (q.v.). Separate funds for special objects have since been added by other benefactors. Its affairs are managed by a board of regents, consisting of the President of the U. S., the Chief-justice, 3 Senators, 3 members of the House, and 6 citizens. The executive office is called Secretary. This post has been filled by Joseph Henry, 1846–77, Spencer F. Baird, 1877–87, S. P. Langley since 1888. Its library of 300,000 titles is deposited in the National Library. It issues various serial publications: *Contributions to Knowledge*, 28 vols.; *Miscellaneous Collections*, 36 vols.; *Reports; Bulletins of National Museum*, 1–50; *Proceedings*, 17 vols.; *Reports of Bureau of Ethnology*, 12 vols. The U. S. Weather Bureau and Fish Commission grew out of enterprises which it set on foot. The Astrophysical Observatory and the National Zoölogical Park have been added by the present secretary to the numerous undertakings previously initiated and directed.

Smithsonite. $ZnCO_3$. Zinc carbonate; mineral frequently found associated with other zinc-bearing minerals, and, when abundant, of value as an ore of zinc.

Smith Sound. Between Greenland and Grinnell Land, in Arctic N. America, connecting Baffin Bay with the Polar Sea.

Smith-Stanley, E. G. See DERBY.

Smock, JOHN CONOVER, b.1842. Asst. in N. J. Geological Survey 1864–68 and 1871–85; prof. Rutgers Coll. 1871–85; in N. Y. State Museum 1885; State Geologist, N. J., 1890.

Smock-Frock. Coarse linen outer garment, worn by English laborers to protect the other clothes.

Smoke Arch. Partition thrown across the fire-box of a locomotive boiler to secure more complete combustion by union of the fuel gases with air before they enter the tubes to be extinguished by the low temperature there (see COMBUSTION). It makes the back part of the fire-box into a combustion chamber, and diminishes the discharge of solid fuel from the stack. It is either an arch of fire-brick sprung from the two sides of the water-legs, or a water-table of boiler plate in communication with the water in the legs at sides, front, and rear, so that it is added heating surface, the gases passing through the table by a hole; or else slabs of fire-brick rest on curved water tubes, to force the flame toward the door and the incoming air before they pass together into the open space and into the tubes. Its name comes from its use as a smoke preventer with long flame fuels. See BOILER, FIRE-BOX and LOCOMOTIVE.

Smoke-Box. See BOILER and LOCOMOTIVE.

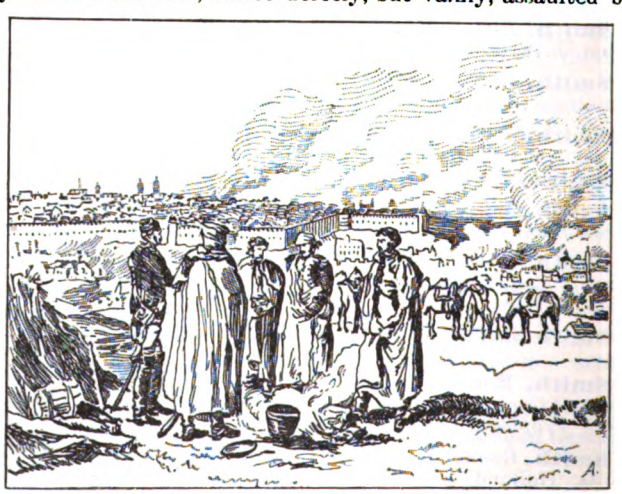
Smokeless Powders. These have been made from nitrostarch, nitrocellulose, nitroglycerin, nitrobenzol, picric acid or mixtures of them, with additions of potassium, ammonium, or barium nitrate. The addition of mineral or non-volatile matter increases the smoke. They effect high velocities to projectiles with smaller charges than prevail with other powders.

Smoke-Prevention. Plans for furnishing sufficient warmed air in furnaces or combustion chambers to secure the union of all the carbon in the fuel with oxygen, and its combustion to CO_2 gas. If there is not oxygen enough, or heat or time enough for this, the carbon is precipitated in fine black particles, which are not combustible at the temperature in which they find themselves; they pass out with the invisible gases from the stack, coloring them black, and constituting smoke. There is no such thing as smoke consumption. See COMBUSTION.

Smoking. The custom of smoking tobacco originated among the natives of America, whence, shortly after the discovery, it spread rapidly over the world. Among the northern tribes the pipe was employed; southward, the cigarette and cigar. The practice was largely ceremonial, and probably sprang from the use of smoke to make the breath visible in the medicine man's rite of blowing upon the sick. Opium is now smoked in China, dried hemp leaves in Mohammedan countries, and tobacco by practically every people on earth. See PIPES and TOBACCO.

Smoky Quartz. See CAIRNGORM STONE.

Smolensk. Old town of Russia, on the Dnieper, 244 m. w. by s. from Moscow; thrice fiercely, but vainly, assaulted by Napoleon, Aug. 16–17, 1812, with fearful slaughter on both sides; fired by the Russians, who silently retreated on the night of the 17th. Pop., 1891, 38,034.


Before Smolensk, August 20, 1812.

Smollett, TOBIAS GEORGE, M.D., 1721–1771. Scottish novelist, resembling Fielding in vigor and coarseness; translator of *Don Quixote*, 1755, *Gil Blas*, 1761, and much of *Voltaire*, 1761–67. *Roderick Random*, 1748; *Peregrine Pickle*, 1751; *Ferdinand, Count Fathom*, 1753; *Sir Lancelot Greaves*, 1760–62; *Humphrey Clinker*, 1771. Of his *History of England*, 1758–64,

the portion covering 1689–1760 is appended to Hume's. His other works include *Travels*, 1766; a satire, *Adventures of an Atom*, 1769; two plays, and a few fine poems.

Smooth. A surface is so called when no resistance to motion is developed when it is moved in contact with another surface. The coefficient of friction between any two surfaces one of which is smooth is always zero.

Smooth Bore. Muzzle-loading gun whose bore is not rifled. Its caliber is always a trifle greater than that of the projectile to facilitate loading. It is rapidly becoming obsolete. Smooth bore projectiles are of necessity spherical in shape, and are made of lead for small arms and of cast iron for cannon.

Smut on Maize.

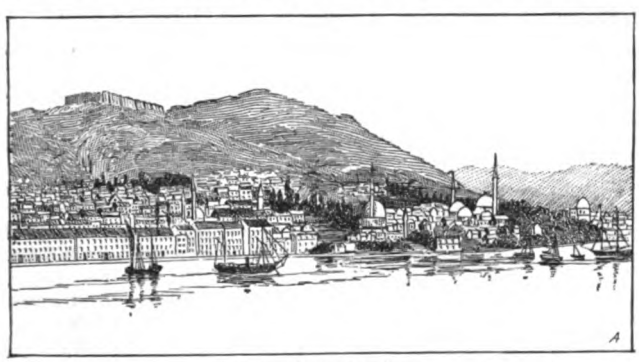
Smuggling. Illegal importation of dutiable articles without paying the import tax upon them; statutory offense in most countries.

Smut. Fungi of the group *Coniomycetes*, parasitic on other plants, and in many cases exceedingly destructive.

Smut. Earthy, dirty coal, such as is frequently seen near the outcrop of a seam.

Smybert, or **Smibert,** JOHN, ab. 1684–1751. Scottish painter, in Boston from 1729. His portraits are of historical and artistic importance.

Smyrna. Only one of the ancient cities of Asia Minor which has survived to the present. It claimed to be the birthplace of Homer, and lay at the entrance of a great fertile plain, with Sardis behind it; rebuilt on a new site, at the head


Smyrna from the Bay.

of the Gulf of S., ab.327 B.C. Polycarp was martyred here ab.169. It was taken by Tamerlane 1402, by Turks 1424. It is the chief seat of Levant trade. An earthquake, May 12, 1875, destroyed 2,000 lives. Pop. ab. 220,000, half Greeks.

Smyth, ALEXANDER, 1765–1830. U. S. Inspector-gen. 1812; M.C. from Va. 1817–25 and 1827–30. *Regulations for Infantry*, 1812.

Smyth, ANDREW WOODS, M.D., b.1833 in Ireland. Surgeon in New Orleans, eminent for difficult operations.

Smyth, CHARLES PIAZZI, LL.D., b.1819. Astronomer-royal for Scotland 1845–88; noted for his theories about the great pyramid, pub. 1864–68. *Teneriffe*, 1858.—His father, WILLIAM HENRY, R.N., 1788–1865, was made rear-admiral 1853 and admiralty's hydrographer 1857. *The Mediterranean*, 1854.

Smyth, JOHN, ab.1552–1612. English separatist, at Amsterdam from 1606; founder of the General Baptists.

Smyth (SAMUEL PHILLIPS), NEWMAN, D.D., b.1843. Pastor at New Haven since 1882. *Old Faiths in New Light*, 1879–87; *Orthodox Theology of To-day*, 1881; *Personal Creeds*, 1890; *Ethics*, 1892.—His brother, EGBERT COFFIN, D.D., b.1829, became prof. at Andover 1863, pres. 1878, and ed. *Andover Review* 1884.—Their father, WILLIAM, 1797–1868, was prof. at Bowdoin from 1825. *Algebra*, 1833–52; *Calculus*, 1856.

Snails. See STYLOMMATOPHORA and BASOMMATOPHORA.

Snake-Bird. See DARTERS and WRY NECK.

Snake Bites. See BITES and SNAKE POISON.

Snake-Head. See BALMONY.

Snake Indians. See SHOSHONES.

Snake-Nut. *Ophiocaryon paradoxum.* Tree of the natural family *Sabiaceæ*, native of Guiana. The large embryo is coiled in the seed, so as to resemble a snake.

Snake Plains. Region in Idaho, Oregon and Washington, through which the Snake River flows; covered with basaltic lava. Area ab. 250,000 sq. m. Lost rivers flow beneath the lava.

Snake Poison. See SOLENOGLYPHA.

Snake River. Fork of the Columbia. It heads in Yellowstone National Park, pursues a tortuous and very rapid course w. across Idaho, with several fine falls, among them Shoshone and American Falls. At the w. boundary of Idaho it turns n. and then w. into Washington, to its junction with the Columbia. Length ab.1,000 m., drainage area 103,835 sq. m.

Snake River. That part of the Mackenzie in Canada which connects Lake Athabasca with Great Slave Lake.

Snakeroot. Plants supposed to be cures for snake bites; among them *Ophiorhiza mungas*, a shrub of the natural family *Rubiaceæ*, native of India; *Chiococca augustifolia*, of the same family, from Brazil, and *Casearia ulmifolia*, of the natural family *Samydaceæ*, also from Brazil.

Snakeroot, BLACK. In e. U. S., herbs of the genus *Sanicula*, natural family *Umbelliferæ*.

Snakeroot, BUTTON. *Eryngium maritimum.* E. American herb of the Carrot family, called also Rattlesnake Master; also species of *Liatris* of the Composite family.

Snakeroot, SENECA. *Polygala senega.* Herb of the natural family *Polygalaceæ*, native of e. N. America.

Snakeroot, VIRGINIA. *Aristolochia serpentaria.* Woodland herb of the natural family *Aristolochiaceæ*, native of e. N. America.

Snakeroot, WHITE. *Eupatorium ageratoides.* White-flowered perennial herb of the Composite family, native of e. N. America.

Snakes. See OPHIDIA and COLUBRIFORMIA.

Snakestone. Placed upon a snake bite, it is supposed by the superstitious that it will absorb the poison. When it is applied to the bite of a rabid dog it is called a Madstone. It usually is of a porous nature and may have strong absorbing power, and this, coupled with the unlimited faith of the person in the stone, may act as a powerful auxiliary to a cure.

Snake-Wood. *Strychnos colubrina.* Small tree of the natural family *Loganiaceæ*, native of the E. Indies, supposed to be a cure for snake-bites.

Snapdragon. *Linaria vulgaris.* Showy-flowered species of the genus *Antirrhinum*, natural family *Scrophulariaceæ*, natives of Europe; cultivated for ornament, and sparingly escaped into waste places in N. America; called also Butter and Eggs and Toad Flax. It is a very troublesome weed in some localities in meadow and pasture land. It seeds abundantly, and also spreads from underground stems: for these reasons is difficult of eradiction. It is not touched by animals under ordinary circumstances, though sheep may be starved to eat it.

Snapdragon (*Linaria vulgaris*).

Snapdragons. Accompaniment of All-Hallows Eve festivities, consisting of small slips of paper with verses written on them, wrapped in lead or tinfoil, placed in a dish and covered with water, over which alcohol is ignited. The players each snatch one through the flames, and the verses are supposed to tell their fortunes.

Snapping Turtles. See CHELYDRIDÆ.

Sneezeweed. *Helenium autumnale.* Showy, yellow-flowered, resinous herb of the natural family *Compositæ*, native of N. America.

Sneezewort. *Achillæa ptarmica.* White-flowered herb of the Composite family, native of Europe, introduced as a weed into N. America.

Sneezing. The mechanism of sneezing consists in a deep and long-drawn inspiration filling the lungs, a closing of the top of the windpipe (glottis) and the opening of the pharynx into the mouth, followed by a sudden, forcible expiration and the sudden opening of the glottis, causing the expired air to pass entirely through the nose.

Snell, or **Snellius,** WILLIBRORD, 1591–1626. Prof. Leyden 1613; precocious mathematician, who discovered the properties of the polar triangle in Spherical Trigonometry. *Cyclometria,* 1621.

Snellaert, FERDINAND AUGUSTIN, b.1809. Belgian essayist and critic.

Snelling, JOSIAH, U.S.A., 1782–1829. Captain 1809, Colonel 1819; active in war of 1812; builder of Fort S., near St. Paul, Minn., 1824.

Snethen, NICHOLAS, 1769–1845. Introducer of camp-meetings in N. Y. and Md.; leader in forming M. P. Ch. *Lay Representation,* 1835.

Snider, JACOB, d.1866. Phila. merchant, inventor of a breech-loading rifle, adopted in England 1866.

Snipe. Limicoline, twilight birds, with soft, mottled plumage; long, soft, flexible bill, and (in true Snipes) eyes placed far back, over the ears. *Scolopacidæ,* the Snipe family, of ab. 90 species, includes also Sandpipers, Curlews, etc. The sexes are unlike, and seasonal variations of plumage occur. In *Rostratula,* a genus represented only in South America, Africa, and s.e. Asia, the female is largest, and does the courting: the male incubates the eggs, the reverse of what obtains in other genera.

Common Snipe (*Gallinago cœlestis*).

Snoilsky, KARL JOHAN GUSTAV, COUNT, b.1841. Swedish lyric poet and diplomatist. His earliest poems, *Smaädikter,* 1861, are characterized by great warmth, especially in its descriptions of Italian life and scenery.

Snore Hole. For admission of water in snore piece, at lower end of a set of mining pumps.

Snoring. Noisy breathing during sleep caused by the vibration of the soft palate during inspiration; this is only possible when the mouth is open.

Snorre, STURLASON, 1178–1241. Icelandic historian and poet, author of the *Heimskringla,* a chronicle of Norwegian kings to 1177, and (of part, at least) of the *Younger Edda.*

Snow. Precipitation of the vapor of the atmosphere when the temperature is below freezing. It falls in flakes, each of which is a distinct crystal or a combination of crystals. Over 1,000 different forms of crystals have been observed. See HAIL and ICE FLOWERS.

Snowball-Tree. Cultivated form of the Cranberry-tree, *Viburnum opulus,* a shrub of the natural family *Caprifoliaceæ;* known also as Guelder-rose.

Snowberry. *Symphoricarpus racemosus.* White-berried shrub of the natural family *Caprifoliaceæ;* native of n. N. America, much planted for ornament.

Snowberry, CREEPING. *Chiogenes hispidula.* Low, white-berried plant of the Heath family, native of deep woods in n. N. America.

Snow Cocks (SNOW PHEASANTS). Gallinaceous birds dwelling among the heights (6,000 to 18,000 ft. elevation) of the Asiatic mts., breeding near the snow line. They are large and shy, weighing 3 to 6½ lbs., and have a length of 19 to 29 in. They post sentinels while feeding. See PHEASANTS.

Snowden, JAMES ROSS, 1810–1878. Director U. S. Mint 1853–61; author of several numismatic works.—His nephew, ARCHIBALD LOUDON, b.1837, was supt. of the Mint 1879–85.

Snowdon. Mt. of N. Wales, with five summits. Greatest altitude 3,560 ft.

Snowdrop Tree. See SILVER-BELL TREE.

Snow Limit. Altitude on mountain sides at which snow is found to remain perpetual; lower in summer than in winter. This in Greenland is 2,350 ft., Norway 5,100, Alps 8,800, Caucasus 11,000, Rocky Mts. 12,500, Himalaya 19,500, Bolivian Andes 16,000 and Patagonia 6,000.

Snow Plow. Of the various forms in use, a revolving one is shown in the cut, the helical blades of the plow throwing the snow by centrifugal action to one side of the track.

Snow Plow.

The earlier forms of snow plows required oftentimes the combined power of 15 locomotives to push them through the drifts, when the snow had become thoroughly compacted.

Snow Shed. Built over a railroad cut to prevent the accumulation of snow. For this item of snow protection the Canadian Pacific Railway has expended ab. $4,000,000.

Snow Shoe. Light frame of wood supporting a web of rawhide which is fastened to the foot, so as to prevent the foot from sinking into the snow. The Canadian snow shoe is from 3 to 5 ft. long and 1 to 2 ft. wide. In Norway, the ski is used for the same purpose and is from 8 to 10 ft. long but only 4 in. wide.

Snuff. Powder used as an errhine. Tobacco is the usual basis, but small quantities of other articles are added, to vary its flavor, pungency, and scent. Its use has greatly fallen off in late years.

Snuff Bottles. The use of snuff was common among the Indians of the Amazon, who were described at the time of the discovery as using short tubes with which they blew the substance into each other's noses. A similar custom is said to survive among the Uitotos. In Morocco and many parts of Africa snuff is carried in bamboo boxes made of a joint of the reed. In China, small bottles of glass, porcelain, and jade are employed. These objects are often elaborately carved and decorated, and are much sought by collectors, both in Europe and the East.

Snyders, FRANS, 1579–1657. Flemish animal painter; a vigorous designer and fine colorist, associated with Rubens.

Soane, SIR JOHN, 1753–1837. English architect, prof. R. A. 1806. *Buildings,* 1828.

Soap. In its widest sense, metallic salt of a fat acid; commonly a sodium (hard) or potassium (soft) salt of a fat acid or a mixture of fat acids, usually consisting of stearic, palmitic, and oleic acids; made by boiling fats with caustic soda or potash.

Soap Bark. *Quillaia saponaria.* Tree of the natural family *Rosaceæ,* native of Chili. Its bark is used for washing as a substitute for soap, as is that of *Pithecolobium bigeminum* of n. S. America, under the same name. It is added to fruit syrups, used with soda-water, to form foam. See SAPONIN.

Soapberry. *Sapindus saponaria.* Small tree of the natural family *Sapindaceæ,* native of tropical America. Its fruit, the size of a gooseberry, is used as a substitute for soap.

Soap-Bubbles. See BUBBLES.

Soap-Bulb. *Chlorogalum pommeridianum.* Bulbous herb of the Lily family, native of n.w. N. America. Its bulbs are used by Indians as a substitute for soap.

Soapstone. 1. Massive variety of TALC (q.v.). 2. In many mining districts, any soft unctuous rock.

Soapwort. See BOUNCING BET.

Sobbing. A series of convulsive inspirations following each other slowly, with the glottis closing early in the act, permitting but little air to enter the lungs.

Sobieski, JOHN III., 1624–1696. King of Poland from 1674; became Commander-in-chief 1667; he routed the Turks at Choczim Nov. 11, 1673, and in 1683, with an army of 50,000, attacked the Turks, who were besieging Vienna with a force of 100,000, routed and pursued them into Hungary. He was less fortunate as ruler than as general.

Sobraon. Village of n. India, on the Sutlej; scene of a British victory over the Sikhs Feb. 10, 1846.

Social Capital. Things made by man, by which the society in question obtains its livelihood; consisting of stores of

commodities for the sustenance of workers, and raw materials, machinery, and all other aids to production.

Social Contract. Supposed agreement, expressed or implied, regulating the relation of citizens with one another, and forming the foundation of civil society.

Social Democracy. Movement in Germany, begun by Lassalle 1862, and developed under the influence of Marx and his followers. It became a political influence 1871, and was subjected to a government proscription 1878–90, but has shown little sign of diminution.

Social Duties. Those which we owe to our fellow human beings, as justice and benevolence.

Socialia. See ASCIDIANS and TERMITES.

Socialism. Proposed reorganization of society, in which the element of competition should be less prevalent, the action of the State more extensive, and, as a consequence, greater equality of conditions exist among the members of the community.

Socialists of the Chair. Certain teachers in German universities and their disciples in other countries, who teach the inadequacy of individual competition and the desirability of a greater extent of State intervention in industry.

Social Psychology. See PSYCHOLOGY.

Social Sanction, IN ETHICS. Pleasures that come from the approval and good-will of our fellowmen, or unpleasantness arising from their disapprobation and dislike.

Social Science. See SOCIOLOGY.

Social War. 1. Between Rome and her Italian allies, 90–88 B.C. 2. Between Athens and her allies 358–355 B.C.

Social Wealth. Sum total of the wealth of the individuals composing a social group.

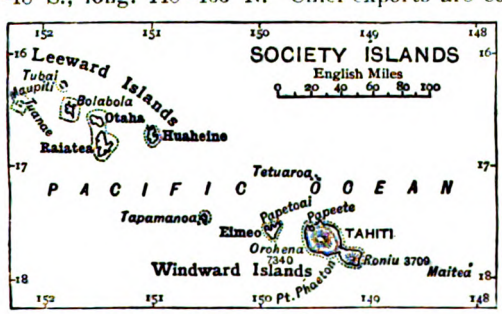
Social Workshops. Institutions proposed by Louis Blanc, in which, by the use of capital loaned by the State, co-operative production should be carried on, forming the basis for a socialistic organization. They were travestied in the National Workshops of the Revolution of 1848.

Societies. Organized association of persons for the accomplishment of some particular object; such as the advancement of science, literature and art, or for mutual aid in distress.

Societies, COLLEGE SECRET. The first Greek letter secret society in U. S. was the Phi Beta Kappa, founded 1776. Chapters of this exist at many colleges; it is now an honorary society, without secrecy, which meets at commencement time. Following this were a number of secret societies, whose object was training in composition and oratory. The present system originated with the Kappa Alpha society, founded at Union Coll. 1825. This was followed by the Sigma Phi and Delta Phi at the same college in 1827. Since then a great number of such societies have been established. Their aims are the promotion of social intercourse and fraternal association, combined with literary culture. They usually have chapters at a number of colleges. Many have chapter houses, where the members lodge and hold their meetings. There is frequently a council or convention of delegates from the chapters, which establish rules of government. Books of songs, catalogues of members and periodicals are issued by many of the fraternities. Graduate chapter houses have also been established. The badge is usually a pin or key, bearing the respective Greek letters.

Society Islanders. Typical Polynesian Malays of beautiful physique, who invaded these Pacific islands and conquered a darker race, who had narrower skulls. Now nominally Christian, they were celebrated for their beautiful tattooing of both sexes, which was so extensive as to give the naked body the appearance of being clothed. They eat animal food only on special occasions, and do their cooking by means of heated stones. See TAHITIANS.

Society Islands. Mountainous group in the Pacific, in lat. 16°–18° S., long. 148°–155° N. Chief exports are cocoanut



Society Islands.

fiber and mother-of-pearl. They comprise two groups, the Windward and Leeward; the former under French protection from 1842, annexed in 1880, and the latter in 1885. They are of volcanic origin, surrounded by coral reefs, and watered by numerous streams. Climate is mild and healthy. Total area 636 sq. m., pop. ab. 16,000. See TAHITIANS.

Society of Friends. See FRIENDS.

Society of Jesus. See JESUITS.

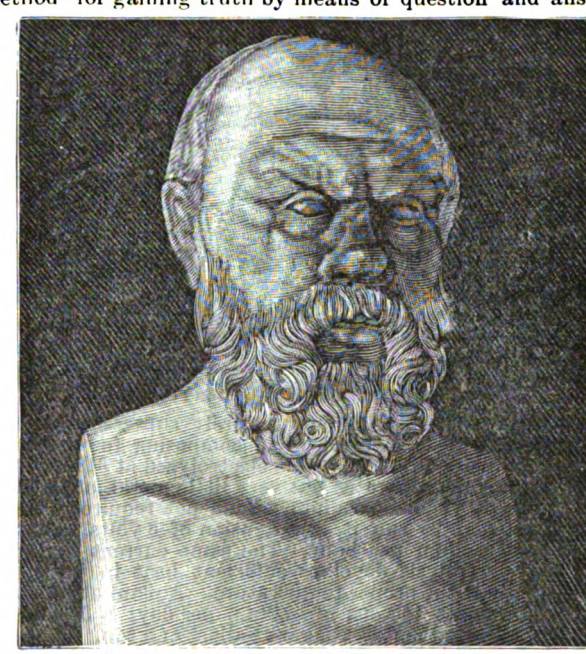
Socin, ALBERT, b. 1844. Swiss Orientalist, prof. Leipzig. *Arabic Grammar*, tr. 1885.

Socinus, LÆLIUS (LELIO SOZZINI), 1525–1562. Italian reformer and refugee. His papers passed to his nephew, FAUSTUS, 1539–1604, who spread his doctrines, anticipating modern rationalism and Unitarianism, through Poland, and endured much persecution. His followers, the Socinians, prospered for a time, but were condemned as traitors by the Diet of Warsaw, 1658, and driven into exile.

Sociology. Science which treats of man in his social relations; including Politics, Economics, and Ethics, as distinctive subjects, and those principles which underlie these and all other relations of men to one another.

Socotra. Island in Indian Ocean, 220 m. s. of Arabia, and 140 e. of Cape Guardafui; held by Gt. Britain 1835–39 and since 1886. Area 1,380 sq. m., pop. ab. 10,000, of mixed blood, chiefly Arab and negro.

Socrates, 469–399 B.C. Athenian philosopher, famous from his personal characteristics no less than the nature of his doctrines; founder of the psychological method; teacher of Plato, and critic of the Sophists; accused of corrupting Athenian youth and condemned to drink hemlock. He applied scientific dialectics to practical questions, originated "the Socratic method" for gaining truth by means of question and answer,



Socrates—Marble Bust in Villa Albani at Rome.

but confined himself to ethical topics, abstaining from physical inquiries. He wrote nothing, and is known to us chiefly through Plato's dialogues and Xenophon's *Memorabilia*. His influence is comparable to that of Jesus; all schools of Greek thought claimed the sanction of his name, and professed to be the true interpreters of his teachings, as all systems of Christian theology and ethics have sought to expound, if not to monopolize, the ideas of Christ.

Socrates, 5th cent. Church historian, resident of Constantinople. His work extends 305–439, continuing that of Eusebius.

Sod. Dense mass of roots and underground stems formed by many of the grasses. Its formation depends mainly upon the habit of the plant, but is aided by soil and climate. Those grasses which form the closest sod are most valuable as lawn grasses, and in general are more valuable for pasture than for curing as hay. Turf is synonymous with sod.

Soda. See SODIUM CARBONATE.

Soda Ash. Commercial sodium carbonate.

Sodalite. $3Na_2Al_2Si_2O_8+2NaCl$. Sodium aluminium silicate combined with a small quantity of chloride; important constituent of some crystalline rocks.

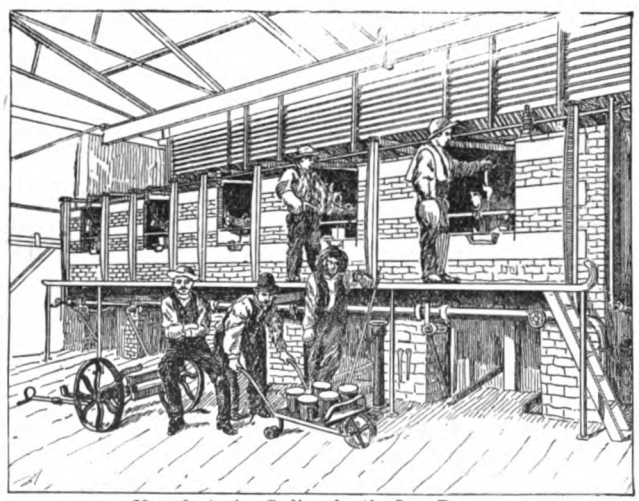
Sodamide. $NaNH_2$. Greenish or red crystalline mass, formed by passing dry ammonia gas over heated sodium. It decomposes readily with water.

Soda Niter. Natural SODIUM NITRATE (q.v.).

Soda Water. Water charged with carbon dioxide under pressure; so named because acid sodium carbonate is sometimes used for making the carbon dioxide.

Sodium, or NATRIUM. Na. At. wt. 23.05, sp. gr. .979, sp. ht. .293, mpt. 95.6° C., valence I.; discovered by Davy 1807; widely distributed in nature, occurring as the chloride in sea water, as rock-salt and Chili saltpeter; very light, soft, silvery white metal, which rapidly oxidizes in the air. It decomposes water, liberating hydrogen. It is kept under benzine or petroleum to prevent the action of the air; even then it gradually becomes coated with a layer of the oxide and hydroxide, which increases with time. The metals sodium, potassium, and lithium may be kept bright by being rubbed with a rag under a mixture of 3 parts petroleum and 1 part amyl alcohol, until it is silvery white, then removed to petroleum containing 5 per cent amyl alcohol, washed with petroleum, and placed in petroleum containing 0.5 to 1 per cent of amyl alcohol. Treated thus, the metal retains its silvery luster for a long time, but finally becomes covered with a coating of the amylate, which may be easily removed by rubbing.

Sodium, METALLURGY OF. It was formerly obtained by subjecting a mixture of sodium carbonate and charcoal to a white heat, or of caustic soda and iron filings to a red heat, and condensing in a flat, book-shaped condenser the vapors of



Manufacturing Sodium by the Iron Process.

sodium driven off. This is now entirely superseded by the Castner process of electrolytically decomposing fused caustic soda, which melts at 312° C. and is electrolyzed at 316°; at 318° to 320° the current separates out very little metal, and at 325° the electrolysis yields no sodium. Each pot requires 7 horsepower of current to run it, at a tension of 5 volts, and produces 1 lb. of sodium per hour. The same current that performs the electrolysis develops sufficient heat in transit to keep the bath at the proper temperature. A plant at Oldbury, England, produces 1¾ tons of sodium per day; a 500 horsepower plant started 1897 at Niagara Falls, ¾ of a ton. The present market price is 50 cts. per lb. Its uses are in making aniline dyes, antipyrine, sodium cyanide (a substitute for potassium cyanide), sodium peroxide (a valuable bleach for silk and wool, and a useful laboratory reagent), and in quickening the amalgamating action of mercury on gold ores.

Sodium Alcoholate. C_2H_5ONa. White crystalline compound, formed by the action of metallic sodium upon absolute alcohol; easily decomposed by water, forming alcohol and caustic soda; used largely in synthesis of organic compounds.

Sodium Alum. $Na_2SO_4.Al_2(SO_4)_3+24H_2O$. Similar in its properties to potassium and ammonium alums, and more difficult to prepare, since it is more soluble than these; not manufactured on a large scale. See ALUMS.

Sodium Aluminium Fluoride. See CRYOLITE.

Sodium Amalgam. Made by dropping sodium upon heated mercury. A number of different amalgams may be obtained by varying the proportions of the constituents. A crystallized compound of the formula Hg_6Na is known, and is used for obtaining hydrogen in alkaline solutions.

Sodium Ammonium Hydrogen Phosphate. $HNaNH_4PO_4$. Microcosmic salt; white crystalline salt, found in guano and decomposing urine; used in the laboratory for blowpipe work, its value depending on the fact that at high temperatures it combines with many metallic oxides, forming colored compounds.

Sodium Biborate. See BORAX.

Sodium Bicarbonate. $NaHCO_3$. Primary or acid sodium carbonate; white solid, made by passing carbon dioxide into a solution of sodium carbonate in water; used in medicine, in baking powders, and for effervescing beverages.

Sodium Borate. See BORAX.

Sodium Bromate. $NaBrO_3$. Small, lustrous, regular crystals; mpt. 384° C., sp. gr. 3.33; soluble in water; made by treating caustic soda with bromine.

Sodium Bromide. NaBr. White solid; made by treating caustic soda with bromine, evaporating to dryness, and igniting the residue with carbon. It melts at 708° C., is soluble with difficulty in alcohol, and is very similar to POTASSIUM BROMIDE (q.v.).

Sodium Carbonate. $Na_2CO_3+10H_2O$. Soda. Anhydrous sodium carbonate has sp. gr. 2.47, is soluble in 6 parts of water at 10° C., 2 parts if boiling water, has an alkaline taste and reaction, melts at a red heat and crystallizes with 62.69 per cent water. In the Le Blanc process it is made from sodium chloride, common salt, by treating with sulphuric acid; the sulphate thus formed is heated with coal and calcium carbonate, and lixiviated with water, leaving calcium sulphide undissolved and sodium carbonate in solution; this is evaporated, and the residue heated, when it loses all its water, forming the soda ash of commerce. Another process in use is the Solvay or Ammonia process. Sodium chloride in solution is treated with ammonium bicarbonate, when sodium bicarbonate is formed; this, being more insoluble than the ammonium chloride formed at the same time, crystallizes out. On heating it is converted into sodium carbonate. It is also made from cryolite. It is manufactured in enormous quantities for use in making glass, soap, for household and a variety of other purposes. It was formerly obtained from the ashes of plants.

Sodium Chlorate. $NaClO_3$. Colorless tetrahedral crystals of the regular system; mpt. 302° C., sp. gr. 2.29; soluble in water; strong oxidizing substance, used in the manufacture of aniline-black; made by passing chlorine into a solution of caustic soda. It is now made by electrolyzing a solution of salt.

Sodium Chloride. NaCl. Salt, occurring widely distributed in the earth (see ROCK SALT), springs, lakes, and sea water, which contains ab. 2.7–3.2 per cent of salt. In some localities it is mined, in others water is used to dissolve it; the solution is then evaporated. In hot countries, the sun's heat is utilized for evaporating ocean water. It crystallizes in colorless cubes, melts at 776° C., and is used as the starting point in the preparation of other sodium compounds, for freezing mixtures, packing meats, soap-making, and for culinary purposes. See SALT.

Sodium Chromate. $Na_2CrO_4+10H_2O$. Made by fusing chromic oxide and sodium nitrate, and evaporating the solution at low temperatures; deliquescent, yellow prisms; of alkaline reaction and a bitter, metallic taste.

Sodium Dichromate. $Na_2Cr_2O_7+2H_2O$. Yellowish-red solid, very similar to potassium dichromate, and now frequently used in place of it, the sodium compound being cheaper.

Sodium Dioxide. Na_2O_2. Peroxide. Pure white mass, made by heating sodium nitrate or igniting sodium in oxygen. It does not decompose on heating. See SODIUM.

Sodium Diuranate. $Na_2U_2O_7$. Uranium Yellow. Made by heating pitchblend, containing 40 to 50 per cent of uranium oxide (U_3O_8) and lime in a reverberatory furnace; used for painting on glass and porcelain, and as a pigment for coloring glass.

Sodium Fluoride. NaF. Colorless, at times opalescent cubes. Decrepitating on heating; sp. gr. 2.76, mpt. 902° C.; slowly and slightly soluble in water; made by neutralizing sodium carbonate with hydrofluoric acid.

Sodium Hydrazoate. NaN_3. Well crystallized, easily soluble substance, very similar in appearance and properties to sodium chloride; made by treating sodium amide with nitrous oxide.

Sodium Hydride. Na_2H. Very similar to POTASSIUM HYDRIDE (q.v.), and made in the same way.

Sodium Hydrogen Sulphate. $NaHSO_4$. Acid sodium sulphate; triclinic prisms, obtained by treating sodium sulphate with sulphuric acid; decomposed by alcohol into the free acid and normal salt.

Sodium Hydroxide. NaOH. Caustic soda, sodic hydrate; very similar to the potassium compound, used more extensively because cheaper; made by treating sodium carbonate in solution with calcium hydroxide; used in the laboratory and for making soap.

Sodium Hypobromite. Similar to SODIUM HYPOCHLORITE (q.v.).

Sodium Hypochlorite. NaOCl. Known only as mixed with sodium chloride in the liquid obtained by passing chlorine into cold, dilute caustic soda.

Sodium Hyposulphite. $NaHSO_2$. Colorless crystals, made by treating a solution of acid sodium sulphite with zinc, or by passing a galvanic current through the same solution; used by dyers and calico-printers for the reduction of indigo. This is not the substance used in photography. See also SODIUM THIOSULPHATE.

Sodium Iodate. $NaIO_3$. Crystals containing varying proportions of water, which they lose at 150° C.; present in Chili saltpeter; made by treating iodine trichloride with sodium carbonate.

Sodium Iodide. NaI. Anhydrous cubes; mpt. 628–633° C., sp. gr. 3.45; very soluble in water; prepared in the same way as POTASSIUM BROMIDE (q.v.).

Sodium Metaborate. $NaBO_2+4H_2O$. White, crystallized solid, obtained by adding the proper quantity of sodium hydroxide to a solution of borax and evaporating to crystallization.

Sodium Monoxide. Na_2O. Gray mass, conchoidal fracture, made by heating caustic soda with sodium.

Sodium Nitrate. $NaNO_3$. Chili saltpeter occurs in large deposits in the rainless districts of Chili, at an altitude of 3,000 ft., s. Peru and Bolivia; containing 27 to 65 per cent of the pure substance, the impurities being common salt, gypsum and sodium sulphate. Deposits have been reported from Nevada and New Mexico. It is used largely in the manufacture of nitric acid, artificial manures, and for certain kinds of powders which are not required to fire quickly.

Sodium Nitrite. Similar to POTASSIUM NITRITE (q.v.).

Sodium Perchlorate. $NaClO_4+H_2O$. Hygroscopic leaflets or rhombohedra, losing water at 45° C.; made by treating the chlorate with nitric acid.

Sodium Periodates. Sundry compounds, the simplest having the formula $NaIO_4+3H_2O$; made by passing chlorine into a warm solution of sodium iodate and treating the product with nitric acid.

Sodium Peroxide. See SODIUM DIOXIDE.

Sodium Phosphates. Primary Sodium Phosphate. NaH_2PO_4. Transparent rhombic crystals; made by adding phosphoric acid to common phosphate of soda (see below). —Secondary Sodium Phosphate. $Na_2HPO_4+12H_2O$. Best known of these compounds; generally called common phosphate of soda; made by treating phosphoric acid with sodium carbonate until alkaline; also from bone-ash; used in medicine as a mild purgative. The commercial compound usually contains sodium sulphate.—Tertiary Sodium Phosphate (Orthophosphate). $Na_3PO_4+12H_2O$. Made by treating secondary phosphate with caustic soda and evaporating. It absorbs carbon dioxide, and has an alkaline reaction.—Sodium Metaphosphate. $NaPO_3$. Formed by igniting the primary phosphate.—Sodium Pyrophosphate. $Na_4P_2O_7+10H_2O$. Colorless glassy substance, made by igniting the secondary phosphate.

Sodium Platinic Chloride. $Na_2PtCl_6+6H_2O$. Red, triclinic prisms or tables, obtained by evaporating a solution of platinic chloride with sodium chloride; soluble in water and alcohol.

Sodium Silicate. Na_2SiO_3. Water glass; made by fusing sand (quartz) with sodium carbonate; soluble in water, the solution being used to give objects a transparent glassy coating; used in the manufacture of artificial stone, silicated soaps, fresco-painting, and in dunging calico.

Sodium Stannate. Na_2SnO_3. Made by fusing tin-stone with caustic soda, or by heating tin with sodium nitrate and caustic soda; made in large quantities for use in calico-printing, as preparing salts or mordant.

Sodium Sulphantimonate. See SCHLIPPE'S SALT.

Sodium Sulphate. $Na_2SO_4+10H_2O$. Glauber's salt. It occurs in small quantities in nature and in a number of natural waters, and is made in large quantities in the manufacture of soda, by the action of sulphuric acid on sodium chloride, and in that of nitric acid from Chili saltpeter. It is efflorescent, and is used as a purgative in medicine, for the production of artificial cold in the laboratory, in the manufacture of sodium carbonate, and of glass. The anhydrous salt is called Salt-cake.

Sodium Sulphide. Na_2S. Solid substance, in color varying with the method of preparation; soluble in water; the solution readily passing to the thiosulphate; made by passing hydrogen sulphide over heated caustic soda in lumps. Sodium also forms a di-, tri-, tetra-, and pentasulphide; see the corresponding potassium compounds.

Sodium Sulphite. $Na_2SO_3+7H_2O$. Transparent crystals, obtained by passing sulphur dioxide into a solution of sodium carbonate and evaporating.

Sodium Thiosulphate. $Na_2S_2O_3+5H_2O$. Better known as sodium hyposulphite or "Hypo"; made by treating caustic soda with sulphur and then passing sulphur dioxide into the solution; used as an antichlor in the manufacture of paper, and extensively in photography to dissolve the excess of the silver compounds on the exposed plate.

Sodom. Ancient town of e. Palestine, destroyed with others for their wickedness (Gen. xix.), and covered by the Dead Sea. See CITIES OF THE PLAIN.

Sodom, APPLES OF. See APPLES OF SODOM.

Sodoma, IL (GIOVANNI ANTONIO BAZZI), ab. 1477–1549. Greatest Sienese painter of his day. In some pictures he rivals the greatest men of his time. Among his few works

St. Sebastian, by Il Sodoma.

extant are fine frescoes in the upper story of the Farnesina Villa at Rome. The *St. Sebastian* of the Uffizi in Florence is his best known work.

Soetbeer, ADOLF, 1814–1892. Prof. Göttingen 1872; writer on finance. *Gold and Silver*, 1879.

Sofala. Portion of s.e. coast of Africa from the Zambesi to Delagoa Bay. It has disused mine workings near Zimbabwe. It has belonged to Portugal since 1505.

Soffit. Interior cylindrical surface of a stone arch.

Sofia, or SOPHIA. Capital of Bulgaria; on a branch of the Isku, near the Balkan Mts.: anciently Serdica; seat of a council 343; held by Turks 1382–1878; of recent development and importance. Pop. ab.48,000.

Softas. Mohammedan students of theology; very numerous, and often active in politics.

Softs, or SOFTSHELLS. Democratic faction in N. Y. 1852–60, disinclined to co-operate with Southern pro-slavery Democrats.

Soft-shelled Crabs. Commercial name given to swimming crabs after the shell is cast and before the new shell has hardened. *Cancer pagurus* is the edible crab.

Sogdiana. Province of ancient Persian empire ab.540–332 B.C.; e. of the Caspian Sea; conquered by Alexander and joined to Bactria.

Sohn, KARL FERDINAND, 1805–1867. German painter, prof. Dusseldorf 1838.

Sohrab. Only son of Rustum, king of Persia, whom, unrecognized, his father slew in single combat; celebrated by Matthew Arnold.

Soignies. Old town of Hainault, Belgium, 22 m. s. of Brussels; scene of a French victory July 10, 1794. Pop. ab. 9,000.

Soiling. Practice of cutting green fodder and bringing it to cattle in the stable, instead of allowing them to graze it or pasture. It is of advantage only where land is very valuable, and is scarcely ever employed except with milch cows.

Soils. The ground or earth, produced by decomposition of rocks and made fertile by natural admixture of decomposed vegetable or animal matter, or by use of artificial fertilizers.

Soissons. Town of France, 65 m. n.e. of Paris; scene of councils 743, 852. 861–862, 866, 1092, 1121 (which condemned Abelard), and 1201; repeatedly taken in war, as by the Armagnacs 1414, by Charles V. 1544, thrice 1814, and by the Germans Oct. 16, 1870. Pop., 1891, 11,352.

Sojourner Truth, ab. 1775–1883. Illiterate negress of N. Y., who lectured in the interest of reforms 1851–ab.1863.

Sokoto. African kingdom, e. of the Niger. Area ab.200,000 sq. m., pop. ab.12,000,000.

Solanaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising ab. 75 genera and ab. 1,800 species, widely distributed throughout the warmer portions of the globe; called the Nightshade family.

Solan-Goose. See GANNET.

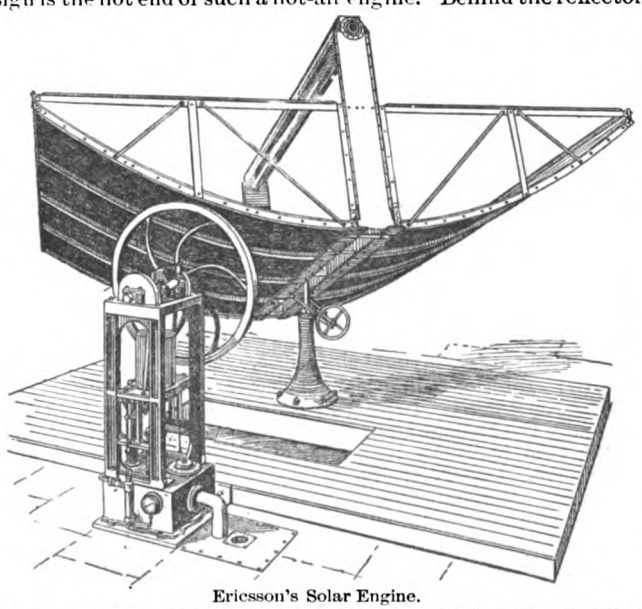
Solanine. $C_{52}H_{93}NO_{18}$(?). Colorless needles, almost insoluble in water, prepared from potato sprouts and from the berries of the deadly nightshade. It is very poisonous, paralyzing the lower extremities, as is shown in cattle which have been poisoned by eating the green shoots of potatoes.

Solano. Warm land wind, in certain valleys in the interior of Spain, belonging to the type of Föhn winds.

Solar Climate. Hypothetical climate that would prevail if the solar heat were the only consideration.

Solar Constant. The approximately constant quantity of radiant heat received by the outer layer of atmosphere of the earth from the sun: its value has been variously determined by Pouillet, 1.76; Violle, 2.5; Crova, 1.90 to 2.32; Langley, 2.84 and 3.0 calorics per minute per square centimeter. The amount of heat received by a square meter of surface on which the sun's rays fall perpendicularly is 25 calorics per min.: this equals the amount required to raise 25 kilograms of water 1° centigrade per min., or 6,886 ft. lbs. of energy per sq. ft. per min.

Solar Engine. Form of motor, devised by John Ericsson 1883, to utilize the heat of the sun for power. The rays fall upon a large reflecting cone or parabola of flat angle, and are converged upon a cylindrical surface, which in the caloric design is the hot end of such a hot-air engine. Behind the reflector



Ericsson's Solar Engine.

are the cooling cylinder and the crank mechanism (see CALORIC ENGINE). It has been calculated that the heat radiated from the sun during a day of nine hours upon a surface of 100 sq. ft. would give a power of 270,000 ft. lbs., or from 8 to 9 horse power for latitudes between the equator and the 45th parallel.

Solar Eyepiece. See HELIOSCOPE.

Solario, ANDREA DA, 1458–1530. Milanese painter of the school of Leonardo da Vinci.

Solar Parallax. See PARALLAX, SOLAR.

Solar Radiation. Influence that emanates from the sun in straight lines, and whose effect at the earth is to produce the phenomena of light, heat, chemical or molecular or actinic change, and electric or magnetic or electro-magnetic effects. It is of the nature of a vibration, rotation, or other periodic motion or change of motion of the molecules of the ether, and it is the effect of such motion in the molecules of ordinary matter that is observed and described as the RADIATION (q.v.) of solar light, heat, etc. In meteorology, the name applies specifically to the heat effect. See SOLAR CONSTANT.

Solar System. See PLANETS and SUN.

Solar Transit. Engineer's transit, to which is attached the necessary devices whereby the true meridian can be determined by an observation of the sun. The principle of the solar attachment is the same as that of the equatorial telescope.

Solar Transit.

Solder. Made of equal parts of lead and tin, two of tin to one of lead, or two of lead to one of tin; they fuse at 185° C., 170° C., and 225° C. It is used in general for soldering purposes.

Soldier. One who engages for a definite period in the military service of his country. He faithfully promises implicit obedience to the orders of his commanding officers, to the rules and articles of war, and is entitled to the protection and care of his government, and to pay, subsistence and clothing while so serving. The recognition of the soldier's service empowers him to take life, destroy property, etc., under the legal orders of his commander without subjecting himself to the civil penalties connected with such acts: neither is he to be held morally responsible for the justice or injustice of the war in which his government may employ him.

Soldier Beetles. Different species of carnivorous beetles, useful in destroying other insects; *e.g.*, the sugar-cane borer and the cotton worm.

Soldo. Former copper coin of some Italian States; equal or inferior to the sou or halfpenny.

Solecism. Grammatical error; so named from Soli in Cilicia, s.e. Asia Minor, where imperfect if not semi-barbarous Greek was spoken.

Solemn League and Covenant. See NATIONAL COVENANT.

Solenoconchæ. See SCAPHOPODA.

Solenoglypha. Sub-order of *Ophidia*, including venomous snakes, having a triangular head, a short tail, a pair of hollow, poison fangs on the maxillaries, with reserve teeth in the rear. The fangs bend back, but can be erected, when the mouth is open, at will. The poison glands are modified salivary glands, and lie back of the eye. The poison can be thrown from the fang several feet. The blood of the victim bitten loses the power to coagulate. On being bitten a person should wind a ligature tightly on the heart side of the wound, which should be excised, sucked, cauterized, and a one per cent solution of permanganate of potassium injected. The drinking of spirits to keep up the heart vigor is the usual remedy. Bile is also a neutralizer of snake poison. Blood or serum from animals rendered immune by repeated inoculation of small, gradually increasing doses of snake poison, on being injected into a person, will render him immune, and has been known to cure when practiced even several hours after a bite. In India 20,000 people die from snake-bites annually, especially from the cobra. Compare PROTEROGLYPHA. See also ADDERS, ANCISTRODON, BOTHROPHERA, RATTLESNAKES, and VIPERS.

Solenoid. Series of circular conductors, arranged with their axes parallel and so joined that a current may pass similarly through them all. Such a system, if freely suspended, will behave in every way like a magnet, setting itself parallel to the lines of force in a magnetic field.

Solera. The foundation, or old stock wine, to which later wines are added. See SHERRY.

Soley, JAMES RUSSELL, b.1850. Prof. U. S. Naval Academy 1876. *Hist. Naval Academy*, 1876; *Blockade*, 1883.

Solfaing. See SOLMIZATION.

Solfatara. Escape of steam from the ground, accompanied by sulphurous and other vapors; also, aperture or craterlet from which it issues.

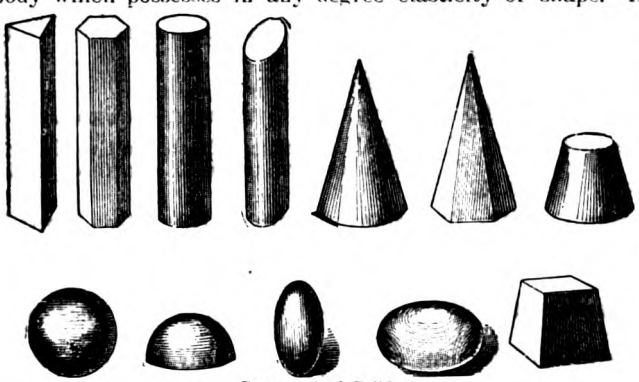
Solfeggio. See SOLMIZATION.

Solferino. Variety of FUCHSINE (q.v.).

Solferino. Village of Lombardy, 19 m. n.w. of Mantau; site of a decisive battle, lasting 15 hours, June 24, 1859, between the allied armies of France and Sardinia under Louis Napoleon and Victor Emmanuel, and ab. 170,000 Austrians under Gen. Hess, who were defeated with loss of 19,300 men and 630 officers; allies lost 17,300 killed and wounded, 986 officers and 8 generals. This victory freed most of n. Italy.

Solicitor. Formerly, legal practitioner in a court of equity; now, in British Supreme Court of judicature. He ranks below a barrister or counsel; his examination and admission to the bar, as well as his duties, liabilities, and rights respecting his clients, are largely regulated by statutes.

Solid. Geometric object of three dimensions, length, breadth, and thickness; generated by consecutive position of a surface moving under some fixed law; of revolution, when the surface rotates on some axis; laminate, when the surface remains parallel in all consecutive positions.—In Physics, a body which possesses in any degree elasticity of shape. A



Geometrical Solids.

rigid solid is one which offers infinite resistance to strain; or the ratio of strain to stress is always 0. Hardened steel perhaps approaches as nearly as anything to this ideal state, though even in steel the rigidity is not perfect. A soft solid is one in which the ratio of strain to stress is very large; *i.e.*, a very small force applied will cause a large deformation. Jelly is a good example.

Solidungula. See EQUIDÆ.

Solidus. 1. Roman gold coin after 295, succeeding the aureus; wt. $\frac{1}{72}$ lb.; used for a time by the Franks. 2. Mediæval silver coin, wt. $\frac{1}{20}$ lb.

Solifidians. Extreme Protestants, charged with so refining Justification by Faith alone as to divorce Faith from Works.

Solifugæ. Hairy, spider-like Arachnids, with the body divided, much as in Insects, into head, thorax, and abdomen. The cheliceræ and pedipalps are much as in Scorpions. Respiration by tracheæ is as in Insects. They are principally found in warm desert regions of the Old World. *Solpugidæ* is the family included.

Soliman. See SOLYMAN.

Solingen. Town of Prussia, 13 m. e. of Düsseldorf; noted since ab.1200 for its iron and steel wares. Pop., 1890, 36,540.

Solinus, CAIUS JULIUS. 3d cent. Latin historian, formerly popular. *Polyhistor*, tr. 1587.

Solipeds. Animals walking on a single toe, *e.g.*, the Horse.

Solis, JUAN DIAZ DE, ab.1470–1516. Spanish seaman; killed while exploring the La Plata.

Solis y Rivadeneyra, ANTONIO DE, 1610–1686. Spanish dramatist, historian of the conquest of Mexico, 1684.

Solitaire. Game for one person, of which many varieties exist; played with marbles or pins upon a board, with cards, and with dominoes. The prototypes of these modern card games are found in the Chinese and Corean solitaire games with dominoes, the object of which was once divinatory. One of the most popular Corean domino games is called "personally counting divination," to distinguish it from the divinatory games participated in by several players.

Solitaria. See ASCIDIANS.

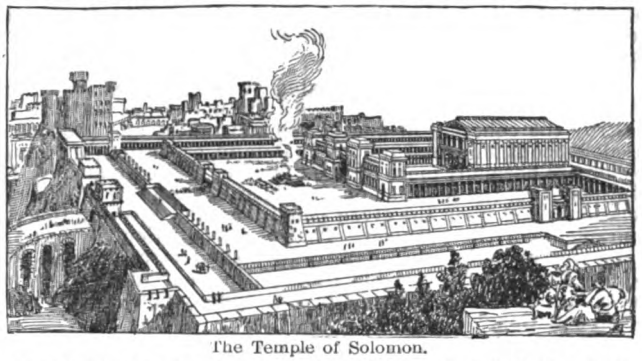
Sollar. Small platform or resting place at the foot of a ladder in a mine shaft.

Solmization. Method of learning the intervals of musical scales by associating each interval with a syllable. Its invention is credited to Guido d'Arezzo, who applied the first syllables of the lines of a Latin hymn to the tone to which it was sung. Thus arose the familiar syllables, Ut, re, mi, fa, sol, la. In Italy Do took the place of Ut.

Solms Laubach, HERMANN GRAFZU, b. 1842. German botanist. *Tentamen Bryogeographiæ Algarviæ regni Lusitani provinciæ*, 1868.

Solo. Tune, air or strain to be played by a single instrument or sung by a single voice.

Solomon, ab.1033–975 B.C. Son of David and Bathsheba; King of Israel from ab. 1015; famed for wisdom; reputed author of three O.T. books. The burdens of his reign led, on his death, to the revolt of the northern tribes, and the division of the nation into the two kingdoms of Israel and Judah.—Builder of the Temple at Jerusalem, ab. 1000 B.C.; burned by Nebuchadnezzar 588 B.C.; rebuilt by Zerubbabel 538 B.C.;



The Temple of Solomon.

reconstructed with great splendor by Herod ab.20 B.C.; finally destroyed by Titus 70.

Solomon, SONG OF. See SONG OF SOLOMON.

Solomon, WISDOM OF. See WISDOM.

Solomon ben Gabirol, d. ab.1041. Spanish Jew, author of poems and philosophic writings.

Solomon ben Isaac. See RASHI.

Solomon Islands. Ab.500 to 1,000 m. e. of New Guinea; held by Germany and Gt. Britain. Area 17,065 sq. m., pop. ab.175,000. The people are sturdy, well-formed Melanesians, with some admixture of Polynesian blood; in height they average 5 ft.: their skulls are mesocephalic. They are dark-skinned, with curly hair, polygamous, fond of dancing, cunning and deceitful; they practice a simple agriculture, make graceful pottery and weapons, and use shell money; their canoes are the finest in the Pacific. They are fond of human flesh. Christianity has made but slight progress among them. Their dead are exposed on platforms.

Solomon's Seal. Plants of the genus *Polygonatum*, herbs of the natural family *Liliaceæ*, natives of the n. temperate zone, the root-stock bearing seal-shaped leaf-scars.

Solomon's Seal, FALSE. Plants of the genus *Vagnera* (*Smilacina*), herbs of the natural family *Liliaceæ*, natives of the n. hemisphere.

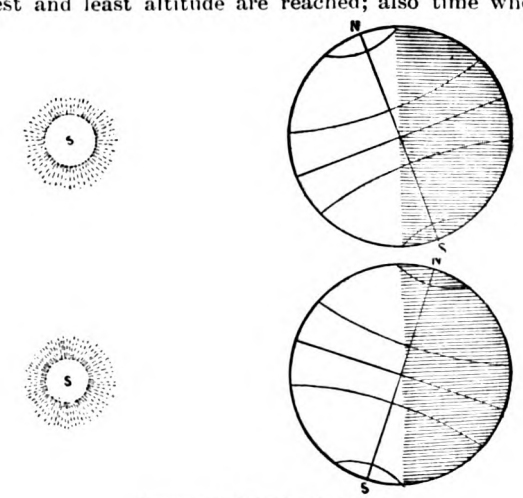
Solon, ab.638–ab.559 B.C. Athenian legislator; commander of the expedition which drove the Megarians out of Salamis; archon 594 with unlimited power. He repealed the laws of Draco, except such as concerned bloodshed, enlarged the functions of the popular assembly, instituted a senate of 400, took measures for relief of debtors, and rectified the calendar. He lived to see his constitution overthrown by Pisiscratus. Some fragments of his poems remain.

Solor. Island of Malay Archipelago off the e. extremity of Flores; s. point in lat. 8° 47′ S., long. 123° 8′ E. Length e. to w. 30 m., breadth 15 m. Pop. ab.30,000.

Soloviev, SERGEI MIKHAILOVICH, 1820–1879. Rector Univ. Moscow 1871–77. His *History of Russia* fills 29 vols. and extends to 1774.

Solpugidæ. See SOLIFUGÆ.

Solstices. Points in the sun's apparent orbit where his greatest and least altitude are reached; also time when the



Summer and Winter Solstice.

altitude is greatest and least. The former is the summer, the atter the winter solstice, June 20–21, and Dec. 20–21.

Soluble Blue. See NICHOLSON'S BLUE and COTTON BLUE.

Soluble Oil. Thick solution in water of the sodium salt or soap of ricinoleic acid, prepared by the action of caustic soda solution upon castor oil. Also ALIZARINE ASSISTANT (q.v.).

Solution. 1. Result of mixing two substances, one usually a liquid or a gas, which have a mutual action such as to destroy the cohesion of one of the substances and produce a homogeneous fluid mixture. 2. In Botany, separation of organs which are normally more or less united or approximate. 3. In Mathematics, the solution of a problem gives a law of general relation based upon the given conditions and meeting the requirements of the problem. That of an equation gives: (1) a value for an unknown quantity in known terms; (2) an explicit function of a variable from an implicit function. The term is also used, unfortunately, as synonymous with "root of an equation."

Solutions, CHEMICAL. Regarded as fluid, unstable, definite chemical compounds in a state of dissociation.

Solvay Process. See SODIUM CARBONATE.

Solway Firth. Inlet of Irish Sea, between Scotland and Cumberland; length 35 m., breadth 2 to 22 m.; noted for the rapidity of its tides.

Solway Moss. In n. Cumberland; scene of a rout of Scottish raiders, Nov. 25, 1542, and of a destructive flood, Nov. 13, 1771.

Solyma, or HIEROSOLYMA. See JERUSALEM.

Solyman (or SULEIMAN) **I.,** 1496–1566. Sultan of the Ottoman empire at its height; able ruler and lawgiver; conqueror of Rhodes 1522, Hungary 1526, and much of Persia and n. Africa 1534. He besieged Vienna 1529 and Malta 1565, unsuccessfully and with heavy losses.—II., 1642–1691. Sultan 1687.

Soma. Plant growing in n. India, and its juice. In Vedic times its sap was held to infuse immortal life and energy into those who quaffed it, and was offered in sacrifices. Hence, third principal deity of the Vedic pantheon, identified with the moon and the moon plant; god of sacrifice; creator, with the aid of Agni, of the heaven and earth, the sun and stars.

Somalis. Mixed race along e. African coast, from equator to Gulf of Aden; allied to the Abyssinians; wild, independent,

Somali Types.

and unfriendly to foreigners; Mohammedans. The region is of indefinite extent, and partly under British (n. part) and Italian protectorates.

Somatic. Pertaining to the body; in Botany, cells which effect the propagation of an organism.

Somatocyst. Cavity in the cœnosarc of certain Siphonophores, at the base of the upper nectocalyx.

Somatology. Study or science of human and other organisms on the material side; also that of inorganic bodies.

Somatropism. In Plant Physiology, directive influence of the soil on the growth of organs.

Sombrero. Felt hat with a wide brim, common in N. and S. America, originally Spanish.

Somerby, HORATIO GATES, 1805–1872. Genealogist of Mass., in England from 1845

Somers, SIR GEORGE, 1554–1611. Colonizer of the Bermudas 1611.

Somers, JOHN, LORD, F.R.S., 1652–1716. Whig leader, M.P. 1689; Baron 1697; Lord Chancellor 1697–1700; impeached 1701; Pres. of Council 1708–10. The *Somers Tracts*, State papers from his library, were pub. in 16 vols. 1748–52, and in 13 vols. 1809–15.

Somers, RICHARD, U.S.N., 1778–1804. Lieut. 1799, commander 1804; distinguished for gallantry on the Barbary coast; killed in an effort to blow up the Tripolitan fleet.

Somers (or SOMMERS) **Islands.** See BERMUDAS.

Somerset, EDWARD SEYMOUR, DUKE OF, 1500–1552. Brother of Jane Seymour; Duke and Protector 1547–49. He executed his brother, Sir Thomas Seymour, 1549; plotted against Warwick, and was beheaded.

Somerset, FITZROY. See RAGLAN.

Somerset, ROBERT CARR. See OVERBURY, SIR THOMAS.

Somerville. City of Middlesex co., Mass., on the Mystic, n. of Boston; part of Charlestown till 1842; chartered 1872. Pop., 1890, 40,152.

Somerville, MRS. MARY (FAIRFAX), 1780–1872. Scottish writer on science. *Mechanism of the Heavens*, 1830; *Connection of the Physical Sciences*, 1835; *Physical Geography*, 1848.

Somerville, WILLIAM, 1677–1742. English poet. *The Chase*, 1735.

Somite. Segment or joint of the body of a segmented animal.

Somme. River of n. France, rising e. of St. Quentin, and flowing 150 m. w. and n.w. to the English Channel.

Somnambulism. Peculiar abnormality of sleep, characterized by the performance of apparently purposive acts, yet with imperfect reaction to sense stimuli and with lack of memory on waking for what has taken place during the state. A common form of it is sleep-walking. The similar condition artificially induced by suggestion or HYPNOTISM (q.v.) is called artificial or induced somnambulism.

Sonata. Literally, sounded piece; antithesis of cantata, a sung piece; originally music wholly instrumental. A sonata is a cyclical composition for a single instrument, with or without accompaniment, consisting of three or four parts, called movements, which are contrasted in tempo and mood, the first of which exemplifies the sonata form. The sequence of movements is generally fast, slow, fast, fast. The first movement written in this form has a triple division. It may or may not have a slow introduction. In the first division the thematic material of the movement is brought forward; in the second, called free fantasia, this material is subjected to the fanciful play of the composer; in the third the first is recapitulated in a related key and provided with a coda. The slow movement may be in the same form or a theme with variations; the third is playful in character, and is usually a Minuet or Scherzo. The fourth may be in the sonata form or a Rondo. Symphonies, concertos for solo instruments and orchestra, and the various kinds of chamber music, such as Trios, Quartets, etc., are sonatas. As an art-form the sonata was perfected by Haydn, Mozart, and Beethoven, who greatly extended it.

Sonderbund. In Switzerland, the union of the Catholic cantons, which led to the war of 1845.

Songkoi, or SONGKA. Largest river of e. Indo-China, rising in the mountains of Yunnan and emptying into the Gulf of Tonquin. Length 750 m.

Song of Birds. The notes of birds are produced in the syrinx, a portion of the windpipe, by certain muscles, in some birds as many as eight pairs. The tongue has little to do with it. It varies from a single note upward, and the males usually excel. In Man and other Mammals the sounds are made in the LARYNX (q.v.).

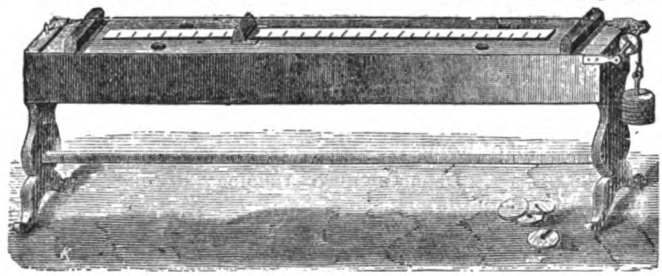
Song of Solomon, or CANTICLES. 22d O. T. book; an idyl, representing the attachment of an Israelitish maiden to her rural lover, though wooed by Solomon; traditionally regarded as an allegory of Christ and the Church; never referred to in N. T.

Songs. 1. Brief poems, adapted to be sung; an important section of almost every literature. 2. Musical forms adapted to these.

Sonnet. Poem of 14 ten-syllable lines, variously rhymed; produced in Italy from 13th century; introduced in France, England, and Germany, ab. 1530–50. Shakespeare is its greatest master; Milton and Wordsworth afford eminent examples.

Sonntag, WILLIAM LOUIS, b.1822. American landscape painter. N.A. 1861.

Sonometer. Instrument for studying the transverse vibrations of strings. It consists of a long box of thin light wood having lateral apertures. Near either end of the box is a bridge or upright piece of wood over which pass strings, or



Sonometer.

often metal wires. The wires are fixed at one end, while the other passes over a pulley and is attached to a weight, or passes round a tuning peg and is stretched by a tuning-key. When the instrument has but one string, it is sometimes called a Monochord.

Sonorescence. That property of hard rubber in virtue of which when a beam of light, intermittent or variable in its intensity or composition, is made to fall upon it, the rubber emits a sound which reproduces in its pitch or quality the peculiarities of the incident light.

Sontag, Henriette Gertrude Walpengis, 1804–1854. Soprano singer, in both Italian and German opera. Her husband was Count Rossi, Sec. of Legation in Berlin, Sardinian envoy at the Hague, and Ambassador at St. Petersburg.

Soot. Deposit of carbonaceous matter in a chimney or flue. It contains sulphate of ammonia, and hence is valuable as a manure for cereals and grasses. See Lampblack and Smoke Prevention.

Sophia. See Sofia.

Sophia, Electress of Hanover, 1630–1714. Youngest child of Elizabeth, queen of Bohemia, and granddaughter of James VI. of Scotland and I. of England; duchess of Brunswick 1658; mother of George I.

Sophia, St. Church at Constantinople; built 532–566 by Justinian at a cost of ab. $5,000,000; chiefly of brick, but lined within with costly marbles; converted into a mosque 1453; finest specimen of the Byzantine style. The dome rises 180 ft., and has a diameter of 107 ft. and a depth of 46 ft. The church is 245 ft. by 225 ft. inside the walls. See Architecture.

Sophism. Fallacy consciously committed in an argument intended to deceive.

Sophists. Body of ethical and rhetorical teachers at Athens, from ab.450 B.C., whose failure to distinguish interest from duty subjected them to the criticism and opposition of Socrates; ridiculed by Aristophanes; defended by Grote in his *Hist. of Greece* in the 67th and 68th chapters. The most eminent were Protagoras and Gorgias.

Sophocles, 495–406 B.C. Second of the three great Attic tragedians. Seven tragedies, *Antigone, Electra, Trachiniæ, Œdipus Tyrannus, Ajax, Philoctetes* and *Œdipus at Colonus*, survive out of 120. He won the first prize over Æschylus and others 468, and was the chief figure in dramatic composition until Euripides came to the front 441. Critics regard him as approaching nearest to the ideal of tragic writing. He partakes of the lofty spirit of Æschylus, and adds more of the human side, as did Euripides, while his characters by their self-restraint and nobility of soul show a higher level of conception.

Sophocles.

Sophocles, Evangelinus Apostolides, LL.D., 1807–1883. Greek teacher, in America from 1829; prof. Harvard from 1849; author of several Greek text-books. *Lexicon of Roman and Byzantine Periods*, 1870.

Sophron, 5th cent. B.C. Greek writer of Syracuse, noted as the inventor of Mimes, a variety of Dorian comedy.

Soprano. In most of the music of to-day, highest part written for women's voices; also the voice itself. In choirs of boys and men the voice belongs to boys; in the 17th and 18th centuries it was frequently produced by sexual mutilation, the quality of the immature boy's voice being retained and coupled with the lung-power of the developed man. In the Sistine Choir boys' voices were used until the intricacy of the music compelled the employment of men. Resort was then had to mature soprano falsettists, most of whom came from Spain, and artificial sopranos, products of accident.

Soracte. Mountain 26 m. n. of Rome, site of a temple of Apollo, and since 746 of a monastery.

Sorata. Peak of the Andes, in Bolivia. Altitude 21,470 ft.

Sorbian Language. Language of the Sorbs or Lusatian Wends. It belongs to the western branch of the Slavic family. It is also called Lusatian-Servian. See Slavic Languages.

Sorbonne. Theological faculty of old Univ. of Paris; founded 1252–56; long of high authority; opposed to the Ultramontanists and Jesuits; suppressed 1790; partially revived 1808 and later. The name is now applied to the Academie of Paris which occupies the buildings, rebuilt since 1884.

Sorby, Henry Clifton, b.1826. English author of many papers on the microscopical structure of rocks and on new methods of studying the optical character of minerals.

Sorcery. See Magic, Witchcraft, etc.

Sordello, 13th cent. Italian troubadour; subject of Browning's poem, 1840.

Soredia. Minute portions of the thallus of Lichens, consisting of one or more alga-cells to which are attached some of the thread-like cells or hyphæ. They break away from the lichen and become propagative bodies.

Sorel, Agnes, 1409–1450. Mistress of Charles VII. of France. Her influence is thought to have been beneficial.

Sorel's Cements. Invented by a French chemist: depending on the principle that an insoluble, solid oxychloride is formed when a concentrated solution of a metallic chloride and the oxide of the same metal are mixed. A solution of magnesium chloride and magnesia mixed to form a pasty mass solidifies to a white mass resembling marble.

Sorema. Mass of loosely coherent pistils placed imbricately on the torus of a flower, as in Magnolia.

Soret's Formula. Used in connection with the Hypsometer (q.v.).

Sorgh, Hendrik Waertensz, ab.1621–1670. Dutch genre painter.

Sorghum. *S. vulgare*, or *Andropogon sorghum*. Tall Asiatic grass. A variety, *Sorghum saccharatum*, in all portions of the U. S. where it will mature, has been proven to be a profitable molasses-producing plant. In more northern localities it makes an excellent forage plant. Culture of sorghum is like that of Indian corn, except that, the seed being slow to start, the seed bed must be better prepared and the ground somewhat warmer before it is planted. In 1890 upward of 24,000,000 gals. of molasses were produced. In 1893 ab. 1,000,000 lbs. of sugar were made from it.

Sorghum Sugar. See Sugar.

Soricidæ (Shrew-Mice). Family of *Insectivora*, distinguished by having feet adapted for running rather than for digging, with external ears and well developed eyes. The tail is scaly, the appearance mouse-like. They are very widely distributed. Some are the smallest of Mammals. The Muskrat or Desman of the Pyrenees stands between the Shrews and Moles: it has a flexible elongated snout, webbed feet, and a musk gland at the root of the rudder-like tail. An allied form exists in Japan, but is burrowing rather than aquatic.

Sorin, Edward, b.1814 in France. R.C. missionary in Indiana 1841; founder Univ. Notre Dame, Ind., chartered 1844, and of many other schools; Superior-gen. of order of Holy Cross 1868.

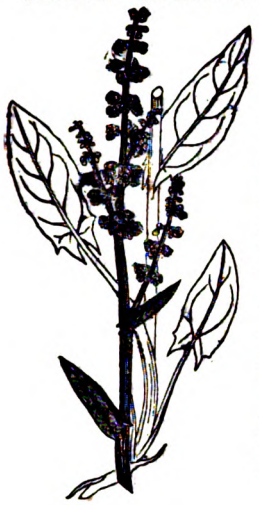
Soris, or Snefru. First king of 4th Egyptian dynasty.

Sorophora. Order of *Mycetozoa*, in which the plasmodium is formed by simple contact, without fusion, of amœboid cells. The fruit consists of spores produced by the encystment of separate amœbulæ, and each spore hatches as a simple amœbula, which, with its fellows, forms a new plasmodium.

Sorosis. In Botany, fleshy collective fruits, as the pineapple.

Sorosis. Club of women in New York, founded 1868. Similar organizations exist elsewhere.

Sorrel. Certain herbs of the genus *Rumex*, natural family *Polygonaceæ*, with acid foliage and small, green flowers, widely distributed. The common *R. acetosella* or Field Sorrel is a native of Europe naturalized in America as a weed, and known as Sour-grass. It takes possession of poor worn-out gravelly soil, and is said to indicate a lack of lime therein. Like the ox-eye daisy, it is not troublesome on lands that are kept fertile and well cultivated. These herbs contain potassium binoxalate.



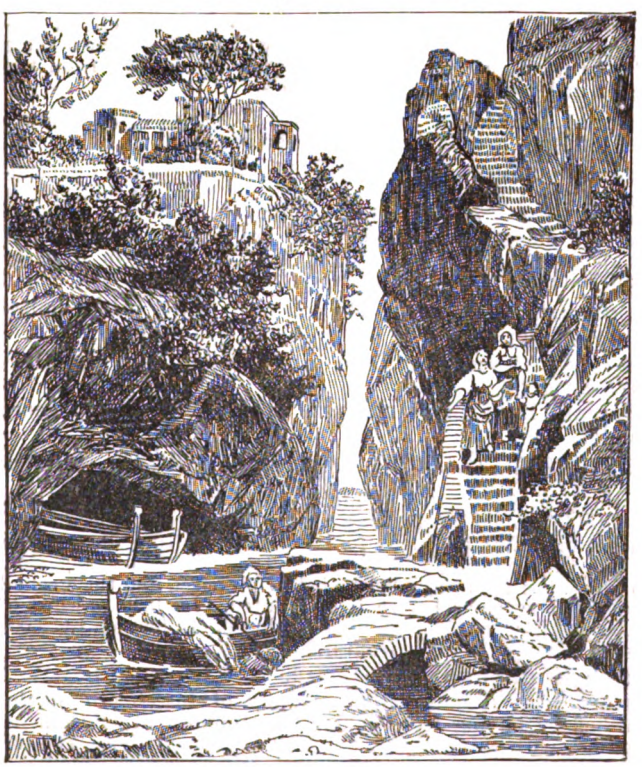
Common Sorrel (*Rumex acetosella*).

Sorrel, MOUNTAIN. *Oxyria digyna.* Herb of the natural family *Polygonaceæ*, native of mountainous regions in the colder parts of the n. hemisphere.

Sorrel, WOOD. *Oxalis acetosella.* Low, pink-flowered herb of the natural family *Oxalidaceæ*, native of the cooler portions of the n. hemisphere.

Sorrel-Tree. *Oxydendrum arboreum.* Small tree of the natural family *Ericaceæ*, native of the s.e. U. S. The foliage is sour, whence the name, Sour-wood.

Sorrento. Ancient Greek and Roman town, on s. side of Bay of Naples; famous for beauty of situation and salubrity of its climate; visited by many tourists; birthplace of Tasso. In



Villa at Sorrento.

the time of Augustus it was noted for its fine buildings, the remains of which are few. Its wine was also held in high repute. Pop. ab.6,100.

Sortes Virgilianæ. See SORTILEGE.

Sortilege. Divination with lots; probably practiced originally with arrows, as indicated by many survivals. Throughout e. Asia it is one of the universal methods of fortune telling. A square or cylindrical box, originally a bamboo quiver, containing numbered lots, is found in most Chinese temples, and in both Buddhist and Shinto temples in Japan. The lots consist of strips of bamboo, in China having an arrow-like tip, painted red, the name of which is homophonous with arrow. The worshipers pay a small fee, and, after sacrificing, shake one or more of the lots from the box before the shrine. The number on the lot or lots is then referred to a book, in which, under a corresponding number, the answer is found. The lots of the Greek and Roman temples were little tablets. Another method consisted in opening a book at random, and taking the first line on which the eye fell as an indication: Virgil was a favorite work for this purpose; hence the Sortes Virgilianæ. Mohammedans use the Koran and Hafiz, and Christians have used the Bible and Psalter. Divination with a book is also common in China.

Sorus. Group of sporanges or spore-cases, as the fruit dot of a fern and of some *Algæ*.

Sosigenes, 1st cent. B.C. Egyptian astronomer, employed by Cæsar in reforming the calendar.

Soter. Bp. of Rome 168–176.

Soteriology. Department of theology dealing with redemption through Christ.

Sothern, EDWARD ASKEW, 1830–1881. English actor, known in America from 1852; famous from 1858 as Lord Dundreary in Taylor's *Our American Cousin.*

Sothic Period. Ab. 1,500 years, required for the beginning of the Egyptian year of 365 days to correspond in succession with all of the seasons.

Sothic Year. Egyptian year of 365 days 6 hrs., the beginning of which corresponded with the heliacle rising of the dog star, called by them Sothis.

Soto, BERNARDO, b.1853. Pres. of Costa Rica 1885–90.

Soto, HERNANDO DE. See DE SOTO.

Soto, MARCO AURELIO, b.1846. Pres. of Honduras 1877–83.

Sotomayor, CRISTOBAL DE, d.1511. Lieutenant of Ponce de Leon in the conquest of Porto Rico.

Souari Nut. See BUTTERNUT.

Soubeyran, JEAN MARIE GEORGES DE, BARON, 1829–1897. French statesman.

Soubise, CHARLES DE ROHAN, PRINCE DE. 1715–1787. Marshal of France; defeated by Frederick II. at Rossbach Nov. 5, 1757.—His relative, BENJAMIN, ab.1589–1642, was a Huguenot leader.

Soublette, CARLOS. 1790–1870. Venezuelan soldier, associated with Bolivar in the war of liberation; Sec. of War 1830–34 and 1839–42; Pres. 1836–39 and 1843–47; in exile 1848–58.

Soudan, or SUDAN. Part of Africa s. of the Sahara and Lower Egypt and n. of the Congo basin, not including Abyssinia. The area is indefinite, but not far from 2,000,000 sq. m. It is drained by the Niger, the tributaries to Lake Tchad and the Nile. The climate is tropical, with a wet and a dry season. Central and w. Soudan are inhabited by native tribes, under their own governments. The e. part was under the control of Egypt till 1884–85, when the Mahdist revolt led to the fall of Khartoum and death of Gordon.

Soudanese. People of Central Africa, comprising more or less pure negro tribes in the s. portion, mixed tribes in the central, and foreign elements n., along the Sahara. Berbers have invaded (prehistorically) the w. and central region, other

A Soudanese Marriage Dance.

Hamites the e., and later, the Semitic, Mohammedan influence, has entered the e. and center. The Fulah are the most important Hamitic negroes. They are intelligent, and zealous Mohammedans. The Mandingoes are true negro Mohammedans. See TUAREGS, DAHOMEY, ASHANTI, and FAN.

Soul. In popular language, the spiritual and immortal part of man. The words thus translated were of varying and

unfixed signification, sometimes meaning in Hebrew merely life, and in Greek opposed either to reasoning mind or to spirit, thus indicating, though not uniformly, the lower impulses and passions. This vagueness, for which Aristotle is in part responsible, remains. See PSYCHOLOGY.

Soule, JOSHUA, D.D., 1781–1867. M.E. bp. from 1824; leader in M.E. Ch. South from 1844, residing at Nashville.

Soulé, PIERRE, 1802–1870. French journalist, at New Orleans from 1827; U. S. Senator 1847–53; U. S. Minister to Spain 1853–55; imprisoned 1862; noted for eloquence.

Soule, RICHARD, 1812–1877. Associate ed. Worcester's *Dictionary*, 1859. *Synonyms*, 1871.

Soulié, MELCHIOR FRÉDÉRIC, 1800–1847. French dramatist and novelist.

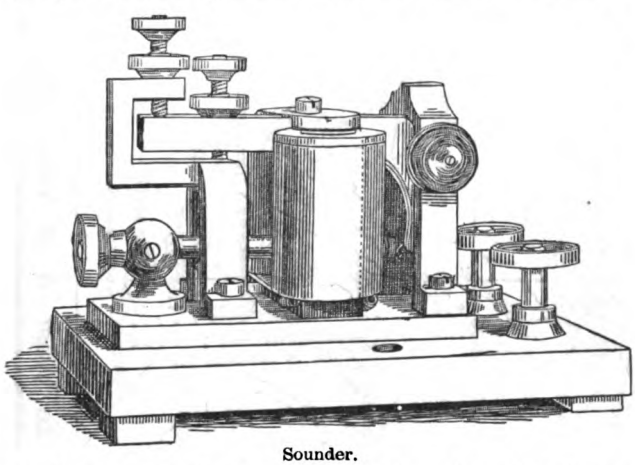
Soulouque, FAUSTIN ÉLIC, 1785–1867. Haytian slave, freed 1793; insurrectionist; General 1844; Pres. 1847; Emperor, as Faustin I., 1849–59; defeated by Geffrard 1859, and exiled. He unsuccessfully invaded Dominica 1849 and 1855.

Soult, NICOLAS JEAN DE DIEU, 1769–1851. French general 1794, Marshal 1804, Duke of Dalmatia 1807; prominent at Austerlitz and Jena, 1805–6, and in Spain as Commander-in-chief 1809–12; in exile 1815–19; Peer 1827; Marshal-gen. 1847.

Sound. 1. Physically, wave motion propagated through an elastic medium by the longitudinal vibrations of its particles. 2. Physiological sensation in the ear by such wave motion. Sounds may differ in intensity, pitch, and quality.

Sound. Strait or passage connecting two portions of the sea; especially that between the Baltic and the Cattegat.

Sounder. Small electromagnet, in front of the poles of which is a soft iron armature attached to a lever controlled by a spring; employed very generally on telegraph lines for receiving the signals by sound. When the current is made to



Sounder.

pass, the armature is drawn toward the poles; when the current is interrupted the spring draws the armature back. The clicks which accompany these motions are slightly different in sound and the dots and dashes of the Morse alphabet can be readily distinguished.

Sounding Apparatus. Tackle employed by mariners for ascertaining the depth of water and character of the ground. The lead and line are still in universal use. The lead has a cavity which is partly filled with tallow to which the ground adheres. The common hand lead weighs from 7–11 lbs. See BATHOMETER, DEEP-SEA SOUNDING, and SOUNDING LINE.

Sounding Line. Used on shipboard to measure depth of water. The greatest depth so far sounded is 4,655 fathoms e. of Japan. With a ship in motion, there is now used fine steel wire, suspending a brass tube, with an inner glass tube, open at the lower end only, and coated internally with a paint soluble in water, which shows the hydrostatic pressure.

Soup. Decoction of flesh for food, seasoned more or less strongly; strong broth.

Soupé, MARIE JOSEPH, 1738–1794. French physician, writer on cholera, which he studied in Peru 1784; guillotined.

Sour-Grass. See SORREL.

Sour-Gum. See PEPPERIDGE.

Sour-Sop. See CUSTARD APPLE.

Sour-Wood. See SORREL-TREE.

South, SIR JAMES, 1785–1867. English astronomer, knighted 1830.

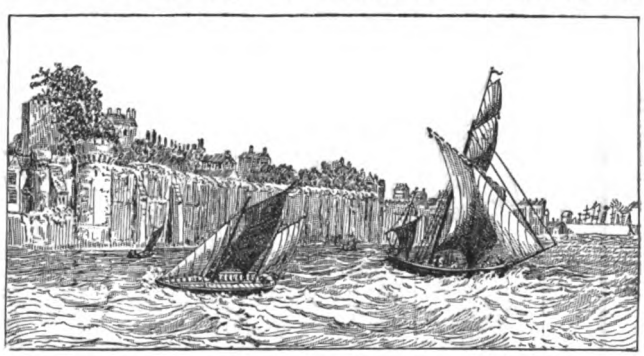
South, ROBERT, D.D., 1633–1716. Prebendary of Westminster 1663, chaplain to Charles II. 1678; famous as a preacher. His works have frequently been reprinted.

South African Republic. See TRANSVAAL.

South America. S. grand division of the w. continent; connected with N. America by Isthmus of Panama. In shape it is rudely triangular, with a long narrow angle pointing s. Along the w. coast, from Panama to Cape Horn, runs a high, continuous, and rugged mountain system, the Andes. Between it and the Pacific there is but a narrow ribbon of land. E. of it the level of the country drops immediately to nearly sea level and there succeeds a great plain, treeless in the n. in Venezuela, where it is known as llanos, heavily forested in the basin of the Amazon, near the equator (selvas), and again treeless further s. in the Argentine Republic (pampas). In the e. part of Brazil the land rises into a second system of mountains, broader than the Andes, but of much less height and length. The area is 6,861,400 sq. m. The mean elevation is 2,078 ft. The coast is simple, with few harbors or islands. The temperature varies with latitude, being very high in the Amazon valley, while in the extreme s. it is severely cold. The rainfall is excessive near the equator, diminishing n. and s., becoming very light in the s. parts of the Argentine Republic. The principal rivers are the Amazon, the greatest on the globe, and the Rio de la Plata. The population is estimated at 28,380,000. These consist almost entirely of the aborigines and the descendants of the Spanish and Portuguese. The principal countries are Brazil, Guiana, Colombia, Venezuela, Argentine Republic, Paraguay, Uruguay, Chili, Peru, Ecuador, and Bolivia; except Guiana, these are republics.

South American Indians. See INDIANS, PAMPAS INDIANS, PATAGONIANS, PERUVIANS, TUPI-GUARANI, CARIBS, and FUEGIANS. Among these tribes civilization increases northward, and also with altitude. Of the Amazon tribes, some are cannibals, and some are dangerous enemies of travelers. A few of the coast tribes have been slightly improved by the efforts of R. C. missionaries. They live by hunting, fishing, and the cultivation of cassava. The majority of the tribes use arrows poisoned by curari. Some practice the couvade, some apply torture of a severe kind to girls and boys on attaining their majority, which occurs about the time of puberty. Dissipation abounds.

Southampton. Seaport of Hampshire, Eng., at the junction of the Itchin and Test; settled ab.500; birthplace of Dr. Watts. It has an important commerce. The remains of its



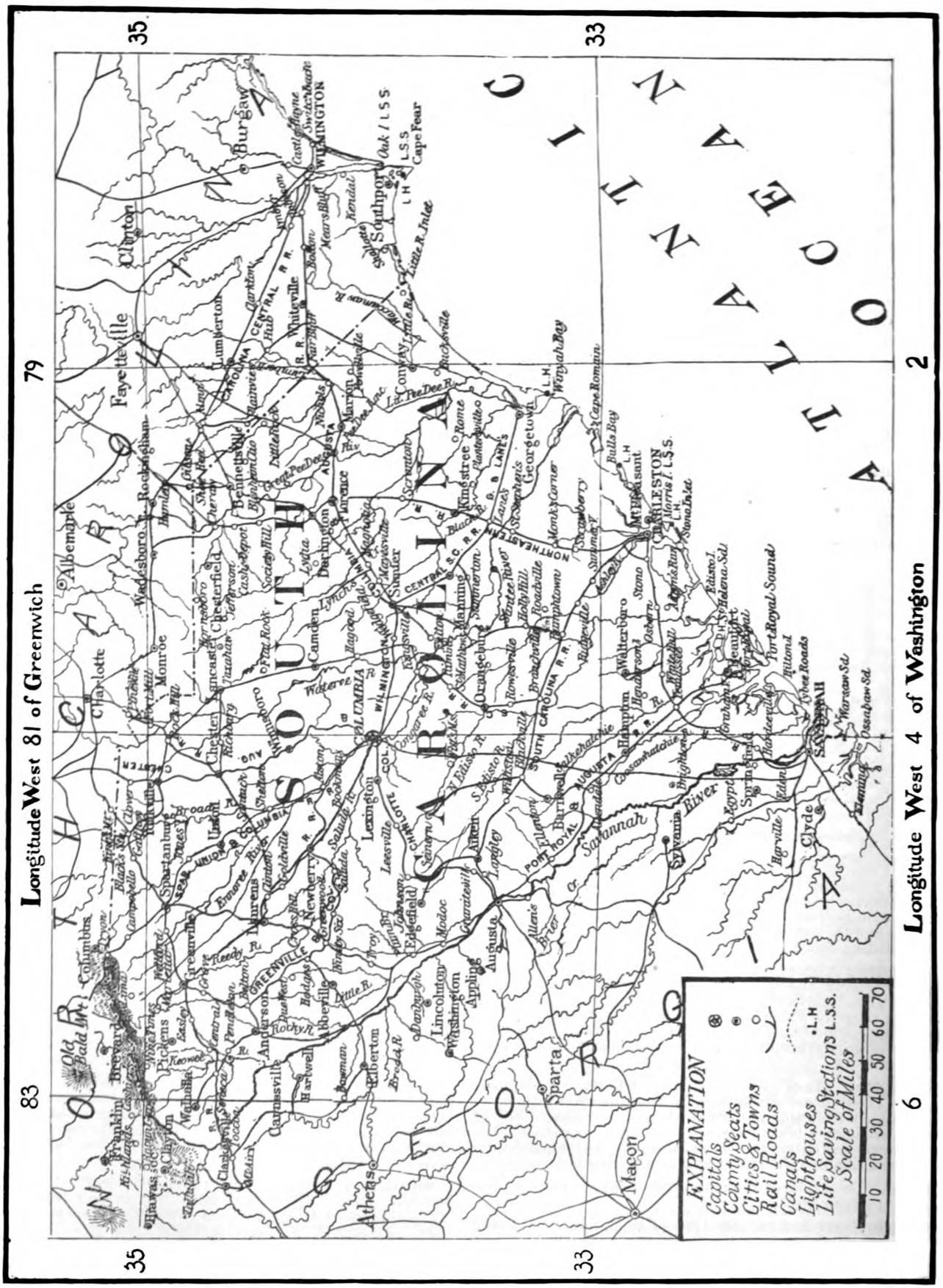
The Walls of Southampton.

town walls, with a fine arcade on the w. shore, with 4 out of 7 gates, Norman house, etc., show its ancient importance. The Town Quay is 6,072 ft. long. Pop., 1891, 65,325.

Southampton, HENRY WRIOTHESLEY, EARL OF, 1573–1624. Sentenced to death 1600 as partaker in Essex's insurrection; interested in the colonization of Va.; imprisoned 1621 for efforts against tyranny; officer in the Dutch war with Spain 1623; patron of Shakespeare, whose early poems, 1593–94, were dedicated to him.

Southard, SAMUEL LEWIS, LL.D., 1787–1842. Justice N.J. Supreme Court 1815; U.S. Senator 1821–23 and 1833–42; Sec. Navy 1823–29; Atty.-gen. of N. J. 1829, Gov. 1832; pres. Senate 1841. *Reports N. J. Supreme Court*, 1819–20. — His father, HENRY, 1749–1842, was M.C. from N. J. 1801–11 and 1815–21.

South Australia. British colony occupying the middle part of Australia; formed 1836, enlarged 1863. The surface consists mainly of arid plains, 3,000 to 4,000 ft. above the sea. The settled portion is on the s. coast. Copper mines were opened 1843, and gold 1846–52. The capital is Adelaide. Area


Longitude West 81 of Greenwich
Longitude West 4 of Washington
35
79
83
33
2
6
ATLANTIC OCEAN
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
WILMINGTON
CHARLESTON
COLUMBIA
GREENVILLE
Cape Fear
Cape Romain
Tybee Roads
Tort Royal Sound
Savannah River
Sassafras Mt.
Old Bald Mt.
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lighthouses
Life Saving Stations
Scale of Miles
10 20 30 40 50 60 70

914,000 sq. m.; pop., 1891, 320,431, including 4,895 in the Northern Territory, annexed 1863.

South Bend. Capital of St. Joseph co., Ind., on St. Joseph River, 85 m. e. of Chicago; settled 1820 by Frenchmen; chartered 1835 and 1865; seat of Univ. Notre Dame. Its chief manufactures are of wagons and farming implements. Pop., 1890, 21,819.

South Bethlehem. Borough of Northampton co., Pa., on the Lehigh, opposite Bethlehem; seat of Lehigh Univ. and of the Bethlehem Iron Co., employing ab. 4,000 men. Its growth has been since 1865. Pop., 1890, 10,302.

South Carolina. One of the s. Atlantic States. The e. part is low and level, and near the coast marshy. This is succeeded on the w. by a gentle slope rising to the foot of the Blue Ridge, where it reaches 1,000 ft. All its streams flow s.e. into the Atlantic, and the larger of them are navigable to the Fall line. Geologically the State is extremely simple. The Archæan formation covers the upper part of the Atlantic plain. In the central part this is succeeded by Eocene, and that by Neocene formations, while the immediate coast is bordered by Quaternary beds. Its industries are agricultural, consisting in large measure of the cultivation of cotton. In 1890 farms were valued at $99,104,600; and the agricultural product, in 1889, at $51,337,985. It was originally a portion of the single colony, Carolina, which was divided 1729. A vain attempt to settle the region was made in 1562, when Coligny obtained permission from Charles IX. of France to establish a Protestant colony in Florida. It was not permanently settled until 1670, by a party of English colonists with grants from Charles III.; Port Royal was founded, and a settlement was made on the site of Charleston 1680. Important battles were fought in S. C. during the Revolution. It led in the Nullification movement, 1833, and was one of the first States to secede 1860. The Civil War began with the bombardment of Fort Sumter in Charleston harbor. S. C. suffered heavily during the war, and has been slow to regain its prosperity since. It is sometimes called the Palmetto State. Capital, Columbia. Area 30,570 sq. m.; pop., 1890, 1,151,149, three-fifths colored.

Southcott, JOANNA, 1750–1814. Prophetess of an English sect 1792, of which a remnant survived 1887; author of many alleged revelations. She professed to be the woman of Rev. xii., and expected to give birth to a new Messiah.

South Dakota. One of the n. central States. The e. part consists of the valley of the James, which is fertile and well watered, and is separated from the Missouri by a broad, low plateau, known as the Coteau du Missouri, which has a fertile soil, but is somewhat deficient in rainfall. W. of the Missouri the country is arid. The s.w. part is occupied by the Black Hills, which are covered with forests, and in which are located valuable mines of gold and tin; the former producing $4,266,897 in 1895, those of tin not being profitable. The State was formed 1889. The capital is Pierre on the Missouri. Area 76,700 sq. m.; pop., 1890, 328,808. See DAKOTA. (See Map, page 1422.)

South Dakota, UNIVERSITY OF. Opened 1883 at Vermillion as Univ. of Dakota; name changed 1891. It has 16 instructors and ab. 280 students.

Quadrant of the Southern Heavens from the Pole to the fortieth degree, showing the Southern Cross, *a*, and the Triangle, *b*. The two bright stars at *c* are α and β of Centauri.

Southern Confederacy. See CONFEDERACY, SOUTHERN.

Southern Cross. Constellation first noted 1679 by Royer. Right ascension 12 h., declination 60° S.

Southerne, THOMAS, ab. 1660–1746. English dramatist. *Oroonoko*, 1696.

Southernwood. *Artemisia abrotanum.* Shrub of the Composite family, with bitter aromatic foliage, native of s. Europe; much cultivated in gardens.

Southey, ROBERT, D.C.L., 1774–1843. English author, long associated with Coleridge and Wordsworth; pensioned 1807; poet laureate 1813. His epics, *Thalaba*, 1801, *Madoc*, 1805, *Curse of Kehama*, 1810, and *Roderick*, 1814, with a vast number of ballads and minor poems, are now less valued than his prose works, which include histories of Brazil, 1810–19, and the Peninsular War, 1823–32; lives of Nelson, 1813, J. Wesley, 1820, and Bunyan, 1830; *Book of the Ch.*, 1824; *Naval History*,

Robert Southey.

1833–40, and *The Doctor*, 1834–37.—His second wife, CAROLINE ANNE (BOWLES), 1787–1854, m. 1839, pub. much verse.

Southgate, HORATIO, D.D., 1812–1894. Missionary bp. of Constantinople 1844–50; rector in Boston 1852–58, and New York 1859–72. *Armenia*, etc., 1840; *Cross above Crescent*, 1877.

South Georgia. Group of islands in the s. Atlantic, belonging to Gt. Britain; lat. 54° 30′ S., long. 36°–38° W.; area ab. 1,000 sq. m.; discovered 1675; uninhabited.

South Mountain. In Md.; scene of a Confederate defeat Sept. 14, 1862.

South Park. Broad elevated valley in Colorado. Elevation 8,000 to 10,000 ft.

Southport. Watering-place in Lancashire, at the Ribble's mouth, 18 m. n. of Liverpool. Pop., 1891, 43,026.

South Sea. See PACIFIC.

South Sea Bubble. English speculation, initiated 1711. A company assumed the public debt, on which government was to pay 6 per cent after 5 years, with a grant of the monopoly of the South Sea trade; to secure this monopoly £7,500,000 were paid. The stock rose from £100 to £1,000; similar companies sprang up, supported by public infatuation. All collapsed 1720, entailing enormous loss.

South Shetland Islands. In the Antarctic Ocean, extending n.e. and s.w. between lat. 61°–63° 30′ S., and long. 53°–63° W. They are mountainous, covered with ice and snow, and surrounded by deep water. Area ab. 850 sq. m.

South Shields. See SHIELDS, SOUTH.

Southwell, ROBERT, 1560–1595. English Jesuit, poet, and martyr, imprisoned 1592, repeatedly tortured, and hanged at Tyburn. Some of his poems possess eminent devotional, philosophical, and poetical merit.

Southwest Territory. Organized 1790 from lands ceded by N. C. and S. C. Tenn was taken from it 1796, and it ceased to exist on the organization of Miss. Territory 1798.

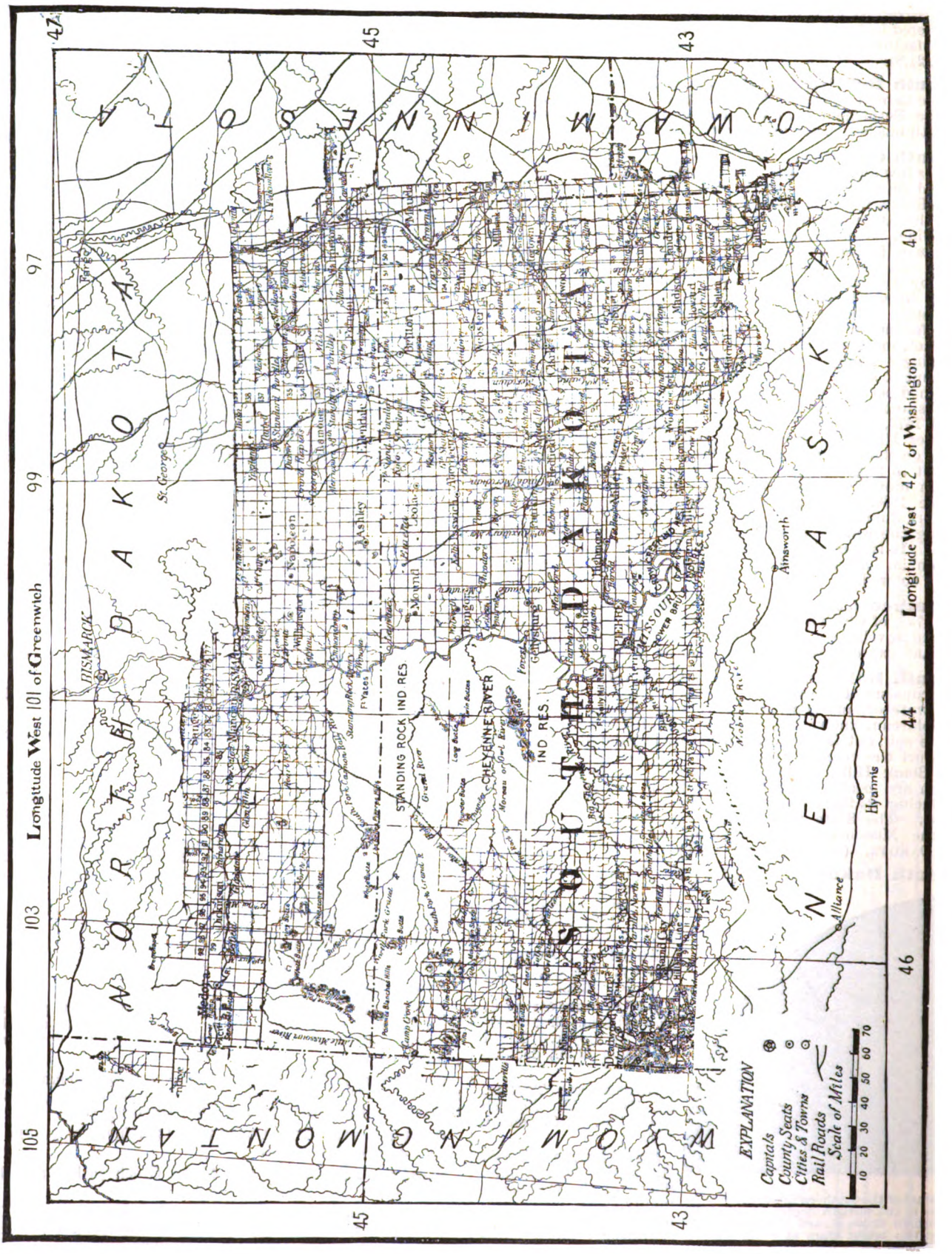
Southworth, EMMA DOROTHY ELIZA (NEVITTE), b. 1819, m. 1840. American novelist.

Soutzo, ALEXANDER, 1803–1863. Greek satiric and dramatic poet.

Souvestre, ÉMILE, 1806–1854. French novelist. *Les Derniers Bretons*, 4 vols., 1835–37; *Riche et Pauvre*, 2 vols., 1836; *Foyer Breton*, 2 vols., 1844; *Un Philosophe sous les Toits*, 1854. His plays have less merit.

Souza, MME. ADELAIDE MARIE ÉMILIE (FILLEUL) DE, 1761–1836. French novelist. *Adèle de Sénanges*, 1794; *Eugénie et Mathilde*, 1811.

Souza, or **Sousa,** MARTIM AFFONSO DE, ab. 1500–1564. Gov.


Longitude West 101 of Greenwich
Longitude West 42 of Washington
NORTH DAKOTA
SOUTH DAKOTA
MONTANA
WYOMING
NEBRASKA
BISMARCK
Fargo
St. George
Ashley
Mobridge
Pierre
Chamberlain
Huron
Watertown
Sioux Falls
Yankton
Mitchell
Aberdeen
Sioux City
Alliance
Hyannis
Ainsworth
STANDING ROCK IND RES
CHEYENNE RIVER IND RES
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60 70

and colonizer of Brazil 1530–32; Admiral or Gov. of Portuguese India 1534–45.—His brother, PEDRO LOPES, ab.1500–1539, assisted in these activities.—Their relative, THORNE, d. ab.1560, was first Gov.-gen. of Brazil, 1549–53, and founder of Bahia.

Sovereign. 1. Ruler of a state; usually, but not necessarily, a single person. 2. British gold coin, pound or 20 shillings; minted since 1817.

Sovereignty. Power to make and enforce law in a state. In the U. S. it is divided, so far as domestic affairs are concerned, between the State and Federal Governments, each being sovereign with respect to subjects committed to it by the U. S. Constitution. In international relations the Federal Government is the sovereign power.

Sower, or **Saur,** CHRISTOPHER, 1693–1758. German printer, in Germantown, Phila., from 1738. His Bible, 1743, was the first pub. in America after Eliot's.—His son, CHRISTOPHER, 1721–1784, reprinted this 1763 and 1776, and was a sufferer in the Revolution.

Sowerby, JAMES, 1757–1822. Illustrator of *English Botany*, 36 vols., 1792–1807; *Fungi*, 3 vols., 1797–1803; *Mineralogy*, 7 vols., 1804–17; and *Mineral Conchology*, 4 vols., 1812–20.—His son, JAMES DE CARLE, 1787–1871, pub. supplements to the first and last of these.—His nephew, GEORGE BRETTINGHAM, 1812–1884, wrote much on natural history.

Sowing. See DRILL, GRAIN.

Sow-Thistle. Coarse, spiny-toothed, yellow-flowered herbs of the genus *Sonchus*, natural family *Compositæ*, natives of the Old World, extensively naturalized as weeds in America.

Sow-Thistle (*Sonchus arvensis*).

Soy. *Glycine soja.* Herb of the natural family *Leguminosæ*, native of India; cultivated for its seeds.

Soyer, ALEXIS, 1809–1858. French chef, in London 1830–55; writer on cookery.

Sozobranchia. See PERENNIBRANCHIATA.

Sozomen, HERMIAS, ab.400–443. Of a Palestine family. Historian of the Ch. 323–439.

Sozura. See URODELA.

Spa. Belgian resort, 20 m. s.e. of Liege. Its chalybeate waters, known since ab.1370, are widely used; its name has become generic. Pop. ab.7,500.

Space. Indefinite extension in all directions, and something a definite portion of which is occupied by every material body as a condition of its existence. According to W. T. Harris, "the mind uses the idea of space as an indispensable instrument in thinking the idea of a body."

Space-Perception. The process by which the mind perceives things as extended is one of the most disputed questions of psychology. Perhaps the most widely accepted theory is that every sensation, at least of touch and sight, has an aspect known as extensity or bigness, which is original and innate. With this element as a basis, our developed spatial consciousness is a product of tactual, motor, and visual experience. The earliest space consciousness of the child is evidently largely the result of touch and movement, which with increasing years is supplemented and largely supplanted by the experience of the sense of sight.

Spadiceous. Resembling or pertaining to a spadix.

Spadicifloræ. Families of plants which bear their flowers in a spadix.

Spadix. 1. Fleshy, elongated flower-cluster, found especially in the natural families *Araceæ* and *Palmaceæ*. 2. Analogue in Nautilus of the hectocotylized arm of Cuttlefishes.

Spaeth, ADOLPH, D.D., b.1839 in Germany. Pastor in Phila. since 1867; Prof. Lutheran Theol. Sem. since 1874; author or compiler of sundry religious books.

Spagna, LO (GIOVANNI DI PIETRO), d. ab. 1530. Italian painter of the Umbrian School; of supposed Spanish birth; affiliated with Pinturicchio and Perugino, and a fellow-student with Raphael.

Spagnoletto. See RIBERA.

Spaight, RICHARD DOBBS, 1758–1802. Delegate to Congress 1783, and to the Constitutional Convention 1787; Gov. of N. C. 1792; M.C. 1798–1801.—His son and namesake, 1796–1850, was M.C. 1823–25, and Gov. of N. C. 1835–37.

Spain. Monarchy of s.w. Europe, occupying with Portugal the Iberian peninsula, separated from France by the Pyrenees. Area 197,670 sq. m. Its surface is mainly a plateau, having a mean elevation of 2,600 to 2,700 ft., capped by mountain ranges 8,000 to 11,000 ft. high. Its rivers are of little value for navigation. The climate as regards temperature varies with the altitude, being tropical in the low country along the seacoast, and temperate, with extremes of heat and cold, over the plateau. The rainfall is scanty. The forest area is very small. Agriculture is the most important industry, cereals and the grape being largely cultivated. Its mineral resources are considerable, consisting mainly of iron, lead, copper, mercury, and coal. Its manufactures are of little importance. It has a large foreign commerce, and in 1893 had 6,708 m. of railway in operation. Its principal colonial possessions are Cuba and the Philippine Islands, both now (1898) in revolt. The capital is Madrid.

S. was originally inhabited by Celtic and Iberian tribes. It was partly conquered by Carthaginians, became a flourishing province of Rome, was overrun ab.409 by the Vandals, whom the Visigoths expelled ab.414, and was won by the Arabs 711–714, who established a flourishing empire. The Christians, shut up in the n. mountains, gradually, during 8 centuries, reconquered the territory. Leon, Castile, Aragon, rose into separate Christian kingdoms: these were united under Ferdinand and Isabella. Granada was taken from the Moors 1492; Navarre was absorbed 1575. Under Ximenes the church became the unifying principle. The discovery of America raised

A Bull Fight in a Country Village in Spain.

S. to be the first power of Christendom: it reached its culmination under Charles V., 1517–56, who held the Netherlands, Franche Comté, the Sicilies, and Milan. With Philip II. the decline began: the great wealth from America destroyed productive energy at home, and a narrow policy fettered intellectual development. 1,000,000 industrious Moors were expelled; the church monopolized the state; heresy was furiously persecuted; and between 1678 and 1700 the population decreased from eleven millions to eight. The European possessions were gradually lost. The accession of the Bourbons, 1700 (Philip V.) brought war again, and by the Peace of Utrecht all possessions beyond the peninsula were lost. Napoleon placed his brother Joseph upon the throne 1808; a popular revolution followed, and Ferdinand VII. was restored 1813 to a constitutional monarchy. His reactionary policy caused a revolution; civil war followed 1821–28, and the war of succession 1833–40 between Don Carlos, brother of Ferdinand VII., and Maria Christina, his widow. Maria abdicated 1840; Isabella, her daughter, was proclaimed 1843, and driven out 1868 by an uprising of Liberals. An offer of the crown to Leopold of Hohenzollern-Sigmaringen was refused by him 1870. Amadeus of Savoy was chosen king 1870, and abdicated 1873: a republic followed, and a Carlist war. Alfonso XII., son of Isabella, reigned 1875–85; his widow, Christina (of Austria), has been regent during the minority of her son, Alfonso. Cuban revolution began 1895. Pop., 1887, 17,550,246.

Spalacotherium. Ancient Jurassic Marsupial, whose dentition somewhat resembled that of the Insectivores.

Spalato, or SPALATRO. Town of Dalmatia, near the Adriatic; noted for the remains of an immense palace built by Diocletian and occupied on his abdication 305. Pop., 1890, 15,697.

Spalding, MARTIN JOHN, D.D., 1810–1872. R. C. Bp. of Louisville, Ky., 1850; Abp. of Baltimore 1864. *Evidences of Catholicity*, 1847; *Hist. Reformation*, 1860.—His nephew and biographer, JOHN LANCASTER, b.1840, Bp. of Peoria, Ill., 1877, has pub. *Essays*, 1876, *Means and Ends of Education*, 1896.

Spallanzani, LAZARO, 1729–1799. Prof. Modena 1761, and Pavia 1768. He disputed Buffon's doctrine of spontaneous

generation, and explained the nature of reproduction and of digestion. *Viaggi alle duc Sicilie*, 6 vols., 1792.

Spalling. Process of breaking and sorting ore with the aid of small hammers; intermediate between coarse ragging and fine cobbing.

Span. Nine inches; distance between tips of thumb and little finger when the hand is stretched.

Span. Length of a bridge between two piers, either from center to center or in the clear. The longest span is that of the Forth bridge in Scotland, 1,700 ft. That of the East River Bridge at New York is 1,595 ft. That of the projected bridge over the Hudson at New York is 3,100 ft.

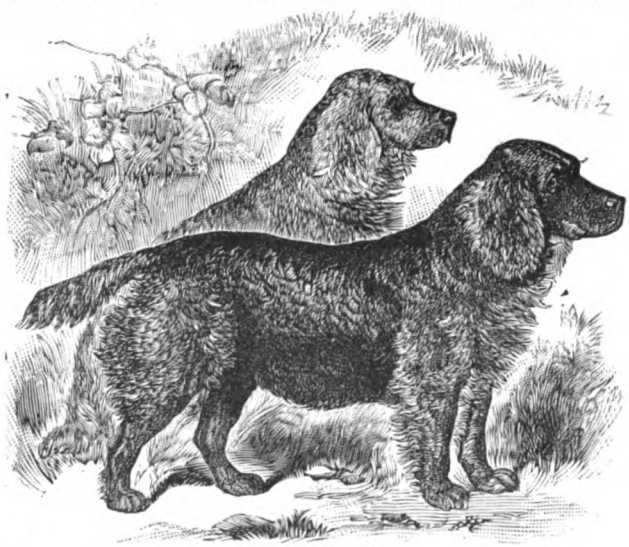
Spandau. Prussian town, on the Spree, 8 m. w. by n. of Berlin; taken by Swedes 1634; held by the French 1806–13. It has a strong citadel, government foundries and factories of arms, and a good trade. Pop., 1890, 44,611.

Spandrel. Space between the extrados of an arch and the roadway.

Spangenberg, AUGUST GOTTLIEB, 1704–1792. Prof. Halle 1731–33; Moravian missionary from 1733, bishop 1744; in America 1735–39 and 1744–62. *Life of Zinzendorf*, 1772–74, tr. 1838; *Exposition of Doctrine*, 1777, tr. 1784.

Spanheim, EZEKIEL, 1629–1710. German numismatist, envoy of the Palatinate in England and France. *Orbis Romanus*, 1704.—His brother, FRIEDRICH, 1632–1701, and father, FRIEDRICH, 1600–1648, were professors of theology at Leyden and controversial writers.

Spaniel. Medium to small dog, with silken hair and large pendulous ears, white and black or with liver-colored spots;



Sussex Spaniels.

most intelligent of dogs, with superior sense of smell and serviceable as a water dog and as a setter for the hunt.

Spanish. See ROMANCE LANGUAGES.

Spanish Ballads. Earliest form of Spanish poetry, and full of the national spirit. They deal with chivalry, history, Moorish themes, and national manners.

Spanish Bayonet. See BEAR-GRASS.

Spanish Blister-Beetle. See HETEROMERA.

Spanish Chronicles. 2d form of Spanish literature; work of different authors from the 13th century or earlier. Some are historical, some romantic.

Spanish Flies. See CANTHARIDES and HETEROMERA.

Spanish Literature. The first period extends ab.1200–1500. To this belong the poem of the Cid, the old ballads, chronicles and romances of chivalry, the early drama, a Provençal literature, and the courtly school of writers. Most of these works are marked by a strong flavor of nationality. The second period, 1500–1700, is the age of Cervantes, Lope de Vega, and Calderon; it is rich in lyric poetry, romantic fiction, and history. This is the golden age of Spanish letters. Then follows a period of decadence, 1700–1800. The writing, mainly dramatic, falls far below the drama of the preceding age. The 19th century has produced distinguished historians, novelists, and dramatists. The new school of writers have opened a brilliant era, and Spanish literature seems entering upon a new lease of life.

Spanish Main. Parts of S. and Central America skirting the Caribbean Sea. The term is used somewhat vaguely, and by some for the sea itself. See TIERRA FIRME.

Spanish Moss. See MOSS, BLACK.

Spanish Music. Special interest in Spanish music extends only to the rhythms and melodies which have been lent to the modern art by the characteristic dances of Spain. The music indigenous to Spain is that of the Basques, who have preserved it distinct from that of others. This has made no impression upon musical literature, and is not heard out of the Basque country. It is distinguished by its mixed rhythms, 5-8 and 5-4 time being common. The florid embellishments of the melodies of the other provinces, and also their intervallic characteristics, indicate that they are of Arabian origin. To the older set of dances belong the Fandangos, Malagueñas, and Rondeñas. Dances which have been introduced since the expulsion of the Moors are the Seguidilla, which came from La Mancha, and is sometimes called Manchega (referred to in Part II., Chap. xxxviii., of *Don Quixote*); the Jota, a kind of waltz of which nearly every province has its own (Glinka wrote a Jota Aragonesa for orchestra, and Sarasate introduced a Jota Navarra in his Spanish Dances); the Cachucha, an Andalusian dance which Fanny Elssler brought into the theater; the Zapateado, el Vito, el Polo, el Ole, and Bolero, of which a fine specimen is in Auber's *La Muette de Portici*. Spohr wrote a violin concerto on Spanish melodies; Weber introduced others in his *Preciosa;* Massenet has used Spanish dances in the ballet of his *Cid*, Moszkowski in his *Boabdil*, and there is charming use of Spanish color in Bizet's *Carmen*. The guitar, the national instrument of Spain, is also of Arabian origin.

Spanish Needles. *Bidens bipinnata.* Coarse herb of the natural family *Compositæ*, with small yellow flowers and awned achenia, which attach themselves to clothing or to the fur of animals; native of N. America.

Spanish Succession, WAR OF, 1702–1713. Waged to prevent Philip of Anjou, grandson of Louis XIV., from ascending the throne of Spain on the death of Charles II. The proposed union of France and Spain was regarded as a menace by the other Powers, and occasioned the alliance of England and Holland against France aided by Bavaria. The conflict was carried on chiefly in n. Italy and the Netherlands, the allies under Prince Eugene and Marlborough winning decisive victories at Blenheim, Ramillies, Oudenarde, and Malplaquet. The Archduke Charles, upon his accession to the throne of Austria, April, 1711, laying claim also to the Spanish crown, his allies preferred of the two the heir of the House of Bourbon, and, save that Austria continued the war for a year longer, it ended with the Peace of Utrecht, April 11, 1713, by the terms of which Spain lost her possessions in Italy and the Netherlands, England gained Nova Scotia, Newfoundland, Hudson's Bay, St. Kitts, Gibraltar and Minorca, and France engaged that the crowns of France and Spain should never be united.

Spanutius, FREDERICK WILLIAM, M.S., b.1868. American chemist; instructor Pa. State Coll. 1888, Ia. State Coll. 1889, Lehigh Univ. 1892.

Spar. In Mineralogy, heavy spar, fluor spar, calc spar, etc. Among miners, any soft, easily cleavable, light-colored, nonmetalliferous gangue.

Spark, ELECTRIC. Luminous phenomenon which takes place when two bodies in different electric conditions are brought sufficiently near. It is due to the incandescence of the air and minute particles of the solid which are carried across by the discharge. Experiment has shown that what seems to be a single spark is really a very rapid succession of separate discharges in alternate directions. The shape and character of the spark depends upon local conditions.

Sparks, JARED, 1789–1866. Prof. Harvard 1839–49, pres. 1849–53; editor of the writings of Washington, 1834–37, and Franklin, 1836–40; of a *Library of American Biography*, 25 vols., 1834–48; and of *Correspondence of the Revolution*, 1854.

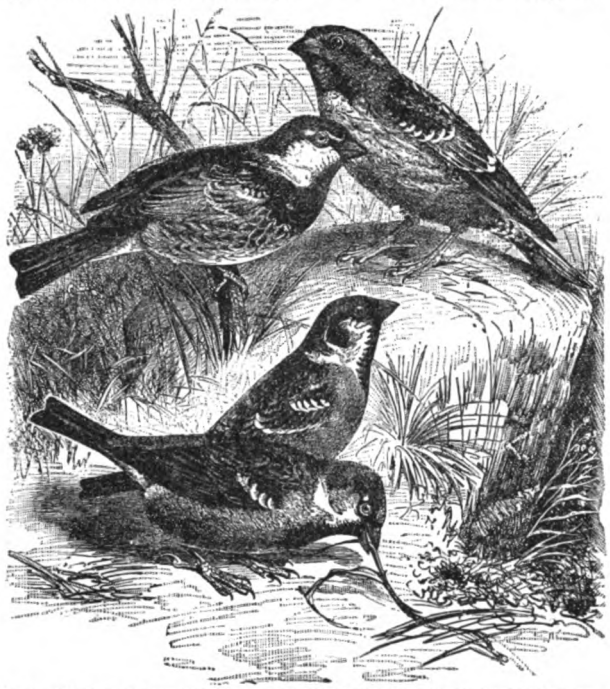
Sparring, or BOXING. Originally considered a mimic fight; contest indulged in for exercise or amusement; distinguished from bare-knuckle fighting. Gloves were usually worn. Sparring is now regarded as rather more scientific, and in contests where a decision as to the better man is to be reached it is said to be "for points." The wearing of gloves does not necessarily make a sparring match, nor is an adept sparrer of necessity a strong fighter, though pugilists of the first rank must be clever in scientific boxing. See PUGILISM.

Sparrow, ANTHONY, D.D., d.1685. Bp. of Exeter 1667, of Norwich 1676. *Rationale of the Prayer Book*, 1643; *Collection of Articles, Canons*, etc., 1661.

Sparrow Hawk. See FALCONS.

Sparrows. Small plain-colored birds of family *Fringillidæ*, with narrow palates, small conical bills, and streaked plumage. The English House Sparrow (*Passer domesticus*) was introduced into U. S. 1853, and has since spread to a re-

markable extent, in cities, driving off other birds. The male has throat, lores, and chin black; the female is without black. They are not streaked below, have white bands in wing and a



Stone (*Passer petronius*), Neckband (*P. hispaniolensis*), Field (*P. montanus*) and House Sparrows (*P. domesticus*).

general chestnut-brown color, much streaked. Length 6 in., of which 2½ is tail. Each pair raises ab. 12 pairs of young per year in ab. 5 broods. Their destruction should be encouraged. They make excellent pot-pie.

Sparta, or LACEDÆMON. Capital of Laconia, on the Eurotas; ab. 6 m. in circuit. Its greatness dates from Lycurgus, ab. 825 B.C. It had chief command in the Persian war, and held the supremacy in Greece from the end of the Peloponnesian war, 405, to 376; but never recovered from its defeat by the Thebans at Leuctra, 371, and refused to share in Alexander's Asiatic expedition. It revived somewhat under Clomenes, 236–221 B.C., but was soon after compelled to join the Achæan league. The Spartans have been styled "stunted Romans."

Spartacus, d.71 B.C. Thracian bandit-chief, taken prisoner and trained for a gladiator. With 70 others he broke away from the school in Capua 73 B.C. and at the head of an army of runaway slaves for two years defied the Roman arms, but was defeated and slain by Crassus. He is the hero of several plays.

Spartianus, ÆLIUS, 2d cent. Latin biographer of the emperors to Septimius Severus. Five of his lives remain in the series of Augustan histories.

Spasm. Convulsive contraction of muscle. It may be general or confined to a part of the body. It is frequently the manifestation of an occupation disease, as drivers, sewing or smith's spasm, where the continuous use of a single set of muscles so reacts upon the nerves as to produce the convulsion.

Spasmodic School. Group of English poets, who displayed an overstrained and unnatural method of sentiment and expression. Among them were P. J. Bailey, S. Dobell and A. Smith. Burlesqued by Aytoun in *Firmilian*, 1854.

Spatangoidea (SPATANGIDEA, PETALOSTICHA). Irregular heart-shaped Sea-urchins, with mouth and anus eccentric in position. They have no teeth; the ambulacral rosette is four-leaved, with four genital plates. They are known as Heart-urchins.

Spathe. Modified leaf or bract which partially incloses a flower cluster (usually a spadix), as in the calla and Jack-in-the-pulpit.

Spathic Iron. See SIDERITE.

Spathilla. Small spathe, especially of palms.

Spatter-Dock. See WATER-LILY, YELLOW.

Spatulate. Leaves or other organs which in outline resemble a spatula.

Spaulding, ELBRIDGE GERRY, b.1809. M.C. from N. Y. 1849–51 and 1859–63; author of important financial measures; "father of Greenbacks." *Hist. Legal-tender Paper Money*, 1869.

Spaulding, LEVI, 1791–1873. American missionary in Ceylon from 1820; translator of books, etc., into Tamil. *Tamil Dictionary*, 1844.

Spaulding, NATHAN WESTON, b.1829. Inventor of an adjustable saw-tooth for mills, ab.1860; U. S. Treasurer at San Francisco 1881–85.

Spaulding, SOLOMON, 1761–1816. Author of a MS. novel alleged to have been procured by S. Rigdon, 1814, and made the basis of the *Book of Mormon*. The original, discovered 1840, supplies small foundation for this legend.

Spavin. Disease affecting the hock joint in horses.

Spawn. Mycelium of the mushroom, *Agaricus campestris*.

Speaker. Presiding officer of a British or American legislature. In the lower house of Congress he has great power.

Speaking-Trumpet. Instrument invented ab.1670 to carry the voice far; truncated cone; much needed and used on ships.

Spear. Wooden shaft, furnished with a sharp point, commonly of metal; of various length and weight, as lance, javelin, pike; used in war from earliest times till firearms were introduced, and still by savages, as the S. African assegai.

Spear-Grass. See MEADOW-GRASS.

Spearmint. See MINT.

Spearwort. Yellow-flowered species of the genus *Ranunculus* of the Buttercup family, natives of wet places in the n. temperate zone.

Specialized Ability. Manual dexterity and acquaintance with practical materials, processes and conditions, required for the special purposes of individual trades.

Specialized Capital. Capital in such a form that it is available for use in the trade for which it was designed, but cannot easily be diverted to another.

Specie Payments. Exchange, on demand, by the government or by a bank, of any amount of paper money for coin of the same face value.

Species. In Logic, a smaller class differentiated from a larger class, the genus, by some peculiar quality called the differentia.—In Natural History, once a fixed type but now a variable type under the influence of environment, heredity and natural selection.—In Biology, subdivision of a genus, consisting of individuals closely alike and congenitally related. According to the creationist, a species has descended from ancestors originally created in conformity to a plan or type which was definitely related to the types of the genus, order, and other higher divisions of the system of classification, being the final analysis of such systematic plan. The subdivisions of a species (*e.g.*, variety, race) are not aboriginal type ideas, but only modifications of an idea due to the action of environment. According to the evolutionist, a species is a group of individuals, differentiated in a definite way, from ancestors from which other species have also descended, by the action of forces at work breaking species into varieties, which are incipient species, species being incipient genera, and a genus an incipient family. In practice the line which divides nearly related species is drawn with a difficulty which increases with the number of specimens which the classifier has under consideration. If we could get a bird's-eye view of every being that ever lived, they would stand continuously related like the parts of a tree. The physiological species (viz., that including all animals that are interfertile) exists only in idea, for some evidently different species are interfertile, while certain members of the same species are intersterile. See CLASSIFICATION, DARWINISM, NATURAL SELECTION, and VARIATION.

Specifications. Rules for conducting work, embracing all matters relating to quality of materials and details of construction, which cannot be given on the drawings.

Specific Conductivity. Measured by the quantity of electricity transmitted per second across a unit of area of an equipotential surface, at which the electric force has unit value.

Specific Duties. Rates of import or export tax calculated according to the quantity, not value, of the article taxed.

Specific Gravity. See DENSITY.

Specific Gravity Bottle. Small flask of thin glass fitted with a ground stopper, and used to determine the specific gravity of a liquid or of small pieces of a solid. If the weight of the solid be w, that of the bottle when full of water w_1, and that of the bottle with the solid in it and then filled up with water w_2, $\rho=\frac{w}{w_2-(w+w_1)}$. For a liquid, if w be the weight of the empty bottle, w_1 its weight when filled with the liquid, and w_2 when filled with water, $\rho=\frac{w_1-w}{w_2-w}$. A temperature correction must be made for any variation from 4° C.

Specific Heat. Amount of heat, expressed in THERMAL UNITS (q.v.), required to raise one unit of weight of a solid substance through one thermometric degree. The English standard is one pound raised 1° F.; the French is one kilo raised 1° C. It is also called capacity for heat. The specific heat of gases will have two values, one for the gas when heated at a constant volume, another for the same gas when allowed to expand in volume. The former is less than the latter by the amount of heat necessary to do the internal work of enlarging the volume of the gas. The dynamical specific heat of a substance is the amount of heat expressed in units of work, which corresponds to one degree of absolute temperature. This is constant for all temperatures. The following table shows accepted values for specific heats:

Glass	0.1770	Hydrogen	3.4046
Iron	0.1090	Marsh Gas	0.5929
Copper	0.0949	Ammonia	0.5080
Zinc	0.0927	Nitrogen	0.2440
Silver	0.0557	Carbonic Oxide	0.2479
Antimony	0.0507	Air	0.2377
Platinum	0.0355	Carbon Dioxide	0.2164
Mercury	0.0330	Oxygen	0.2182
Water	1.0000	Sulphuric Acid	0.1553

The specific heats for the gases are at constant pressure.

Specific Inductive Capacity. Capacity of a dielectric to transmit inductive influence. It is equal to the ratio of the capacity of a condenser in which this dielectric is used to that of an air condenser of the same dimensions; or it is the coefficient by which the inductive power of air must be multiplied to give the inductive power of any dielectric. See DIELECTRIC CONSTANT.

Specific Performance. Equitable remedy by which one party to a contract forces the other to perform it in terms; not generally available if the complainant can obtain adequate relief by a common law action; nor if such performance is impossible or would be unjust.

Specific Resistance. See RESISTANCE.

Specific Rotatory Power. In 1811 Arago observed that when plane polarized light is transmitted through a plate of quartz in the direction of its optic axis, the plane of polarization is rotated through a certain angle depending on the thickness of the plate and color of the light. Other substances, liquids and vapors, as well as solids, were found to possess this property of rotation. The real specific rotatory power, α, of a substance is the rotation, for a given wave frequency, of a layer of the substance 1mm. thick. The apparent power $[\alpha]$ is the rotation of the substance when in solution. If e represent the amount of substance in one grain of solution, l the length of the column, usually given in decimeters, and ρ its density, $[\alpha]=\alpha/el\rho$. The molecular rotatory power is the product of the specific rotatory power by the molecular mass.

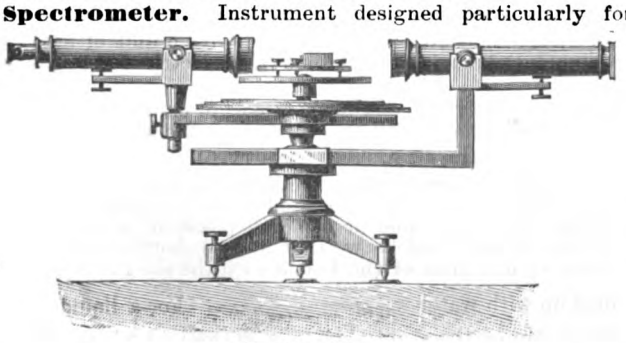
Specimen. Entire plant or animal, or portion of one, selected or preserved for study.

Speckbacher, JOSEPH, 1764–1820. Tyrolese revolutionist of 1809, who, in concert with Hofer, raised the lower valley of the Inn, took Hall, and attacked Innsbruck. He afterward besieged the fortress of Kufstein, and defeated the Bavarians at Lofer and Unken.

Spectacles. Mechanical device whereby lenses may be kept in position in front of the eyes to correct focal or other defects in seeing. It is usually restricted to that form of device resting on the nose and kept in place by temple pieces extending back over the ears. They are said to have been invented in the 13th century.

Spectator. English periodical, 1711–12 and 1714, to which Addison and Steele were the chief contributors.

Spectrometer. Instrument designed particularly for



Spectrometer.

measuring spectrum lines, indices of refraction, or wavelengths of light. It is similar in construction to the spectroscope, but has in addition several graduated circles, in order that the positions of the telescope, collimator, and dispersing apparatus may be accurately ascertained.

Spectroscope. See SPECTRUM ANALYSIS.

Spectrum. See SPECTRUM ANALYSIS.

Spectrum Analysis. Method of studying the composition of substances by an examination of the light they emit when their vapors are rendered luminous. The light is passed through a prism which separates it into its components, arranging them in the order of their refrangibilities. The result is a band of color which may be received on a screen or upon the retina. This band of color is a spectrum: if the luminous source be the sun, it is the solar spectrum. The instrument employed in spectrum analysis is a spectroscope, and consists of two telescopes and a prism. One of the telescopes, the COLLIMATOR (q.v.), is used to bring into a parallel beam the rays of light which are to pass through the prism. It has no eyepiece, but in its place is a narrow adjustable slit, placed in the principal focus of the object glass. The other telescope is used to view the spectrum formed by the prism. The spectrum consists of as many images of the slit as there are rays of different refrangibility in the given light. The light emitted by every elementary substance when its vapor becomes incandescent has its characteristic spectrum; hence the presence or absence of any element in a compound may be readily determined. Bunsen and Kirchhoff first used the prism for this purpose 1860.

Spectra may be classified as follows: 1. The spectrum of the sun, whether received directly or by reflection from the moon or planets, or of the fixed stars, consists of a band of color beginning with red and ending with violet, but crossed by a large number of dark lines. The number, position, and character of these lines varies with the source of the light. They are called absorption lines because they are due to the sifting out or absorbing of certain rays by the chromosphere of the sun or similar envelopes of the fixed stars. The dark lines in the solar spectrum were first observed by Wollaston 1802, but Fraunhofer was the first to map out and describe them 1814. Certain lines in the spectrum, due to the absorption of the earth's atmosphere, are called telluric lines.

2. Incandescent solids and liquids furnish spectra which are completely continuous, containing rays of all refrangibilities from extreme red to extreme violet, depending on the temperature.

3. Incandescent gases and vapors give discontinuous spectra, consisting of a definite number of bright lines, their position and character depending on the substance employed, thus furnishing a delicate qualitative test. By noting the coincidence of many of these bright lines with the dark lines of the solar spectrum, we have the best evidence for supposing that many of the elements with which we are familiar on the earth are present in the sun.

Spectroscope.

4. All transparent media have the power of absorbing certain colors of a continuous spectrum more or less completely, thus forming dark bands. Such are called absorption spectra; and the dark spaces are ABSORPTION BANDS (q.v.).

In astronomical work, the spectroscope is usually fitted to a telescope taking the place of the eyepiece and placed with the plane of its slit in the principal focus of the object glass. Thus the light from various parts of the luminous source can be examined separately. A combination of this sort is called a telespectroscope. If the dispersing prism be formed of several pieces of two kinds of glass, placed in such a way that the deviation is destroyed but the dispersion not, the instrument is known as a direct vision spectroscope.

Specular Iron. See HEMATITE.

Specular Reflection. That which takes place from polished surfaces; regular, as distinguished from irregular reflection, by means of which bodies are visible.

Speculum. Reflector of polished metal.—In Medicine, an instrument for examining inward parts.

Speculum Metal. Alloy of 1 part of tin, 2 of copper, and a small quantity of arsenic, used for making the mirrors of reflecting telescopes. Glass having a film of silver over it is taking its place.

Spedding, JAMES, 1808–1881. Editor and biographer of Bacon, 1857–78. *Publishers and Authors*, 1867; *Reviews*, 1879.

Speech. Form of language; means of expression of thought, characterized by the articulate utterance of audible sounds.

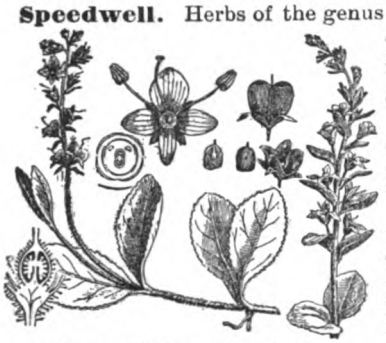
Speed. Rate of change of place along any path, without regard to the direction or its changes. Speed is a scalar quantity, while velocity, which involves direction, is a vector quantity.

Speed, JAMES, 1812–1887. Ky. loyalist, law prof. Univ. Louisville 1855–58, 1875–79; U. S. Atty.-gen. 1864–66.

Speed, JOHN, 1542–1629. English antiquarian and cartographer. *Hist. Britain*, 1611.

Speed of Locomotive. See LOCOMOTIVE.

Speedwell. Herbs of the genus *Veronica*, natural family *Scrophulariaceæ*, of wide geographical distribution, including several common weeds.



Speedwell (*Veronica officinalis*).

Speiss. Product first obtained when arsenical ores are smelted; an arsenide of the metal.

Speke, JOHN HANNING, 1827–1864. English explorer, in Africa with Burton 1854 and 1857–59, and with J. A. Grant 1860–63; discoverer of the Victoria Nyanza. *Source of the Nile*, 1863–64.

Spelling. See PHILOLOGY.

Spelman, SIR HENRY, 1562–1641. English antiquarian, knighted ab.1612. His *Glossarium Archæologicum*, 1626–64, and *Concilia Decreta*, etc., 1639–64, were completed by other hands.—His son, SIR JOHN, d.1643, knighted 1641, wrote a life of King Alfred, 1678.

Spelt. *Triticum spelta*. Tall grass, native of the Old World, cultivated to a limited extent for its grain, which resembles wheat and barley.

Spelter. Zinc in blocks or pigs. See ZINC, METALLURGY OF.

Spence, JOSEPH, 1699–1768. Prof. of Poetry at Oxford 1727; of History 1737; prebendary of Durham 1754. *Polymetis*, 1747; *Anecdotes*, pub. 1820.

Spence, ROBERT TRAILL, U.S.N., 1785–1827. Captain 1815; distinguished in the war with Tripoli 1804 and that of 1812.—His son, CARROLL, 1816–1896, was Minister to Turkey 1853–57.

Spencer, AMBROSE, LL.D., 1765–1848. Atty.-gen. of N. Y. 1802–4; Justice N. Y. Supreme Court 1804; Chief-justice 1819–23; M.C. 1829–31. *Chancery Reports*, 1814–23.—His son, JOHN CANFIELD, LL.D., 1788–1855, was M.C. 1817–19, Sec. of War 1841–43, and of the Treasury 1843–44.

Spencer, HERBERT, b.1820. English author of a *System of Synthetic Philosophy*, based on evolution and aiming at scientific precision and coherence. *Social Statics*, 1850; *Psychology*, 1855–72; *First Principles*, 1862; *Biology*, 1864–67; *Sociology*, 1876–85; *Ethics*, 1879–93. His writings cover a wide range of thought, exhibit the results of vast industry, and are exciting no little influence.

Spencer, ICHABOD SMITH, D.D., 1798–1854. Presb. minister in Brooklyn from 1832. His *Pastor's Sketches*, 1850–53, had a large circulation.

Spencer, JESSE AMES, D.D., b.1816. Prof. Coll. New York 1869–79; editor of classical text-books. *Hist. U. S.*, 1856–69.

Spencer, JOHN, D.D., ab.1630–1695. Dean of Ely 1677. *De Legibus Hebræorum ritualibus*, 1685–1727.

Spencer, JOHN CHARLES, 3D EARL (LORD ALTHORP), 1782–1845. M.P. 1804; in opposition 1807–30: Chancellor of the Exchequer and leader of the Commons 1830–34; active in carrying the Reform Bill 1832 and the Irish Ch. reform 1833; Earl 1834.

Spencer, JOHN POYNTZ, 5TH EARL (1857), b.1835. Lord-lieutenant of Ireland 1869–74 and 1882–85; pres. Council 1880 and 1886.

Spencer, JOSEPH WILLIAM, b.1850. Prof. King's Coll., Windsor, N. S., 1880; Univ. Mo. 1882, and Univ. Ga. 1890; State Geologist of Ga. 1890–93; chiefly engaged in the superficial geology of the Great Lakes.

Spencer, PLATT ROGERS, 1800–1864. American author and teacher of a system of penmanship; founder of business colleges.

Spencer, SARA (ANDREWS), b.1837, m.1864. American advocate of woman suffrage and other reforms. *Problems*, 1871.

Spencer, WILLIAM ROBERT, 1770–1834. English lyric poet.

Spencer Rifle. First magazine gun used during the rebellion, having been introduced into the army in 1860. The magazine carries seven metallic rim-fire cartridges, which are pushed forward toward the barrel by a spiral spring. The breech-block is curved on one face and flat on the other, which closes the breech, and is hinged to the trigger guard. When the latter is pushed forward the block is drawn, opening the breech and allowing a cartridge from the magazine to slip over it. Pulling the trigger guard back, the block rotates to the front and pushes the cartridge home. It is fired by releasing the hammer, which strikes a slide in the block and drives it against the rim of the cartridge. See MAGAZINE GUN.

Spence's Metal. Made by melting together a metallic sulphide and sulphur. When sulphide of iron is used, a grayish-black substance is formed which takes a good polish and can be colored to imitate bronze. It is used like lead in pipe joints and for making busts and medallions. It was first used 1879.

Spener, PHILIPP JAKOB, 1635–1705. Preacher at Frankfort 1666, Dresden 1686, and Berlin 1691; founder of the pietistic school, exerting great influence and encountering vehement opposition. *Pia Desideria*, 1675; *Theologische Bedenken*, 1700–2.

Spengel, LEONHARD, 1803–1880. Prof. Heidelberg 1842 and Munich 1847; writer on Aristotle, 1844–68, and Greek rhetoric.

Spenser, EDMUND, 1552–1599. English poet, whose *Faerie Queene*, 1590–96, is the greatest of allegorical poems. Some of his minor poems are of rare excellence: his *Epithalamion*,

Edmund Spenser.

1595, is the finest wedding-hymn in the language. He marks the resurrection of English poetry after long collapse. He was in Ireland 1580–98, and was ruined by an insurrection. *State of Ireland*, 1633.

Speratus, PAULUS, 1484–1551. German reformer and hymnist.

Spermaceti. $C_{16}H_{31}O_2.C_{16}H_{33}$. Palmitate of cetyl; solid fat, found in head and blubber of sperm whale and others, and *Delphinus edentulus;* sp. gr. 0.94, mpt. 38°–47° C. See CETYL ALCOHOL and SPERM WHALE.

Spermarium. See TESTIS.

Spermatheca. Sac in Tapeworm, in first abdominal segment of Cyclops, etc., for receiving and storing the spermatozoa to be used as needed when the eggs are mature and are passed down the oviducts one by one.

Spermatist. One who believes that the embryo is represented in the spermatozoön and enters the egg only to find a place to receive nourishment. This idea has been philosophically expressed by saying, "the soul is from the father and the

mother clothes it with a body." Aristotle advocated this view. The modern theory, that the female furnishes the conservative and the male the progressive factor in heredity, is at least analogous to the ancient view.

Spermatium. Propagative spore in certain *Fungi* and *Algæ*.

Spermatoblasts. See SPERMOSPHERE.

Spermatocyst. Cell containing a spermatozoid.

Spermatocytes. See SPERMOSPHERE.

Spermatogemme. See SPERMOSPHERE.

Spermatogonia. See SPERMOSPORES.

Spermatophores. Sac-like sheaths surrounding the spermatozoa in Cyclops, Cuttlefish, and other animals, to protect them during transference from the male to the female.

Spermatophyta. Sub-kingdom of plants, including all those which produce seed. See PHANEROGAMIA and ANTHOPHYTA.

Spermatozoid. Coiled protoplasmic body, the male element of fecundation in certain plants, in function similar to the spermatozoön in animals.

Spermatozoön. Microgamete, destined for conjugation with a macrogamete (or ovum) to produce an oösperm (or zygote) from which a new individual will develop. This is the all-inclusive biological definition. In popular terms, one of the animalcules of the male-fluid, essential to fruitful impregnation of the female. When semen fails to contain these, the male is sterile.

Spermoderm. See EPISPERM and TESTA.

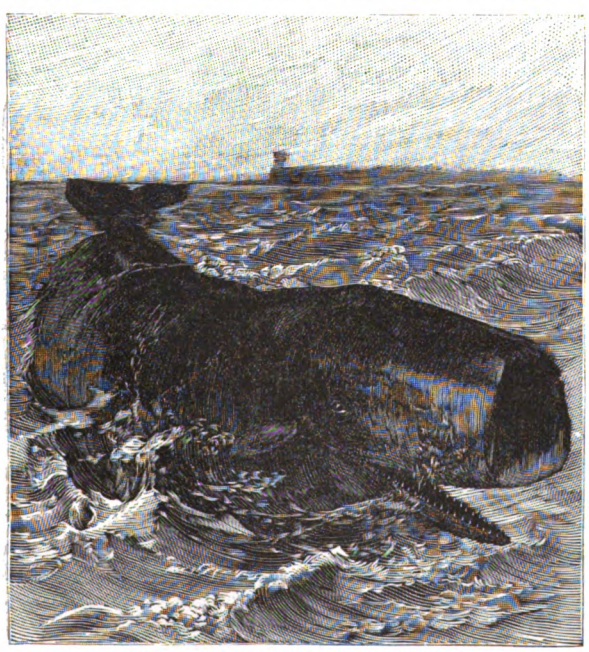
Spermogone (SPERMOGONIUM). Sac containing reproductive spores (spermatia) in certain *Fungi* and *Algæ*.

Sperm Oil. Found with SPERMACETI (q.v.) in the head-cavities and blubber of the SPERM WHALES (q.v.). It remains liquid at 18° C., is saponified by potash, and yields the same fatty acids as spermaceti. It is used as a lubricant for machinery.

Spermosphere (SPERM-MORULA, SPERMATOGEMME). Ball of cells (spermatocytes), which, after completing multiplication, are known as spermatoblasts and are transformed into spermatozoa. They surround a central blastophore, consisting of a cell which plays no part in the multiplication, but probably functions in the nutrition of the other cells of the sperm ball.

Spermospores, or SPERMATOGONIA. Mother-cells of spermatozoa. They develop first into spermospheres.

Sperm Whales (PHYSETERIDÆ). Family of toothed Cetaceans, with united cervical vertebræ, and teeth in the lower jaw only. The blow-holes are on the end of the snout. On



Sperm Whale (*Catodon macrocephalus*).

the top of the head on the right side is a cavity containing fluid oil and spermaceti, ab. 15 bbls. capacity. The throat is large enough to admit a man. The fore-limbs are 6 ft. long. The color is black above and gray on breast. The females and young can stay under water half an hour, the old males more than an hour. They have 5 respirations per minute. They swim in schools in the temperate and warm parts of all oceans, but prefer the s. Pacific. When enraged they have sunk boats, and even ships. The period of gestation is 10 months. Ambergris is found in the intestines of some specimens, resulting from a peculiar decomposition of the cuttlefish food. See CATODONTIDÆ.

Sperrylite. $PtAs_2$. Natural mineral combination of platinum and arsenic, found in very small quantity near Sudbury, Ontario.

Speusippus, ab.394–339 B.C. Nephew of Plato, and his successor as head of the Academy at Athens.

Spey. River of Scotland, the most rapid in Britain. It rises in the hills between Badenoch and Lochaber and empties into Moray Firth. It affords valuable salmon fisheries. Length 110 m.

Speyer. See SPIRES.

Spezia. Principal naval station of Italy; 56 m. s.e. of Genoa. Pop. ab. 20,000.

Sphacelariaceæ. Order of minute marine *Algæ*, mainly parasitic on other plants of the same class.

Sphæraphides. Clusters of crystals of globular form, found in the parenchyma of a great number of plants.

Sphæridia. Small, transparent bodies on stalks, situated on the ambulacral and peristomial plates of Sea-urchins.

Sphærococcaceæ. Order of *Algæ*, of sub-class *Rhodophyceæ*.

Sphærogastra. See ARANEIDA.

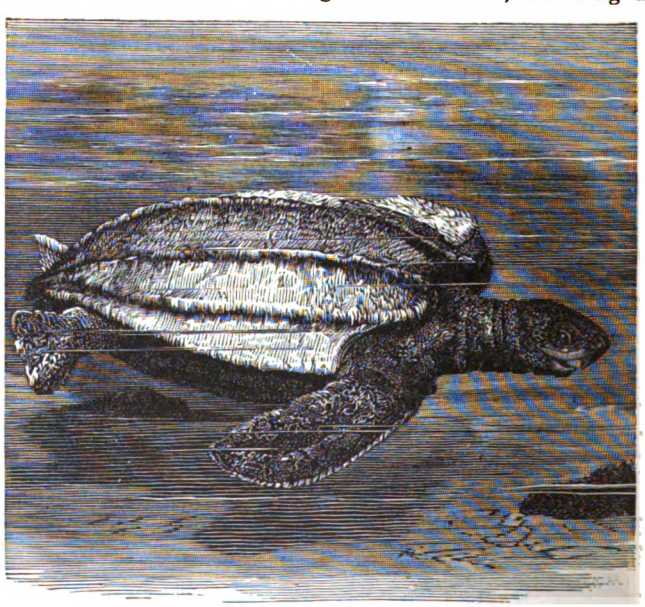
Sphæro-Siderite. Impure varieties of carbonite of iron.

Sphærozoida. Group of *Polycyttaria*, including *Radiolaria*, which have no skeleton, or scattered spicules, outside of the central capsule. Examples are *Sphærozoum* and *Collozoum*.

Sphagnaceæ. Order of *Bryophyta*, comprising the Bog Mosses. All are of the genus *Sphagnum*. They grow in bogs or swamps, principally in regions of low annual temperature but high humidity, where, by their growth and accumulation, they form Peat. Such conditions are well afforded by Ireland, Scotland, and Scandinavia.

Sphalerite. ZnS. Mineral zinc sulphide, widely distributed in nature, and occurring in deposits of widely varying form and origin; important ore of zinc; also called Zinc-blende. See BLENDE.

Sphargidæ. Family of marine *Chelonia*, including the Leatherback. This is the largest of tortoises, attaining a



Leatherback (*Dermochelys coriacea*).

weight of 1,000 lbs. and a length of over 6 ft. Its carapace is undeveloped, and a tough leathery skin protects the body.

The anterior legs are modified into large flippers. It lays over 100 eggs palatable to the taste, as is also the coarse flesh.

Sphene. $CaTiSiO_5$. Mineral calcium titano-silicate, so called on account of the wedge form of its crystals; also called Titanite.

Spheniscomorphæ. See IMPENNES.

Sphenodon. See RHYNCHOCEPHALIA.

Sphenoid Bone. One of the bones of the skull forming a part of its base which, by articulating with them all, acts as a wedge. In shape it suggests the form of a bat.

Sphenotic. Anterior dorsal element of the ear capsule of the vertebrate skull, distinct as a postfrontal in some fishes.

Spheraster. Form of sponge spicule found in the genus *Tethya*, spherical in form yet consisting of numerous rays from a center.

Sphere. Solid generated by revolving a semicircle about its diameter. Every point of its surface is equidistant from the center of the generating semicircle, which is also the center of the sphere. The surface of a sphere whose radius is $R=4\pi R^2$, and its volume$=\frac{4}{3}\pi R^3$.

Spherical Aberration. See ABERRATION, SPHERICAL.

Spherical Angle. That between two arcs of great circles on the surface of a sphere. It is the angle between the tangents to those arcs at their point of intersection, and measures the dihedral angle formed by the planes of the two great circles.

Spherical Polygon. Portion of the surface of a sphere bounded by three or more arcs of great circles.

Spherical Pyramid. Solid bounded by a spherical polygon and the planes of the circles whose arcs are sides of the polygon.

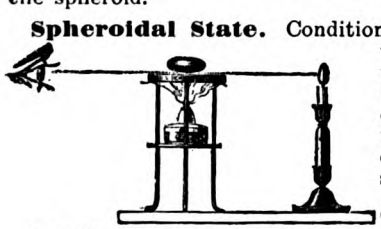
Spherical Triangle. Portion of the surface of a sphere bounded by three arcs of great circles. The ordinary spherical triangle restricts the arcs to less than 180°: the general triangle is unrestricted. The area of a spherical triangle is the trirectangular triangle multiplied by the spherical excess.

Spherical Trigonometry. Discussion of the relations between the elements of the spherical triangle; three sides and three angles. It is based upon the trigonometry of the trihedral, whose vertex is the center of the sphere. The face angles of the trihedral are measured on a unit sphere by the arcs of the spherical triangle, and its dihedral angles have the same measure as the angles of the spherical triangle.

Spheroid. Solid generated by the revolution of a semiellipse about one of its axes; prolate when the revolution is about the transverse axis, oblate when about the conjugate axis.

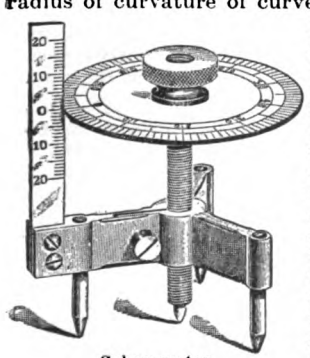
Spheroidal. Geometric forms and concepts based upon the spheroid.

Spheroidal State. Condition of a small quantity of volatile liquid when placed upon a very hot metal surface. The liquid does not come into contact with the metal because of the rapid evaporation from the under surface of the drop, which forms a Crookes' layer. The surface tension changes rapidly at different points, and thus the drop oscillates symmetrically about its mean spheroidal form.



Separation between Globule and Plate.

Spherometer. Instrument designed for measuring the radius of curvature of curved surfaces. In its simplest form it consists of a nut in the shape of a tripod, supported by three feet, through which passes a screw terminating below in a sharp point and above in a graduated head. The adjustments are such that when the point of the tripod and that of the screw are in the same plane the reading is zero. When placed upon a curved surface the screw point must be turned backward until the apparatus is again in exact equilibrium on the surface. The reading of the screw gives the versed sine of the arc, from which the radius may be calculated. It was invented by the French optician De La Roue, to measure the radii of lenses. With it the focal length of the lens is determined.



Spherometer.

Sphincter. Circular muscle surrounding an orifice which closes it by its contraction, as the sphincter ani.

Sphingina. Tribe of *Lepidoptera*, including moths, having elongated bodies, pointed posteriorly. The proboscis is long and coiled. The anterior wings are long, the posterior short; they lie horizontally when at rest, and are united by a retinaculum. The caterpillars are flat, with sixteen legs and anal horns. The pupa-stage is passed in the earth. The moths are usually crepuscular; some are known as Hawk-moths and Humming-birds.

Sphinx. Fabulous monster, represented by the Greeks with a woman's head and a body displaying attributes of the serpent, lion, vulture, and eagle. The Egyptians gave their Sphinx proper the head of a man and the body of a lion. It guarded their temples and tombs, to ward off evil influences.

Great Sphinx at Gizeh.

The Great Sphinx at Gizeh is 150 feet long and incloses a small temple. Its date is unknown. The Sphinx of mythology set a riddle to the Thebans, and slew all who could not guess it; when Œdipus solved it, she slew herself. The Egyptian Sphinx is beneficent, a personification of the fruit-bearing earth, a deity of wisdom.

Sphygmoscope. Apparatus devised by Marey, which, in connection with a registering apparatus, may be used to measure the pressure of liquids. A small tube filled with the liquid and communicating with the point at which the pressure is desired is closed with an elastic capsule, which projects into the cavity of a short and wider tube. As this capsule distends or contracts from the variation in the pressure behind it, it causes compression or dilatation of the air in the larger tube, and this affects the registering apparatus. Variable pressures, as those produced in the blood by the beating of the heart, may be studied in this way.

Spicate. Flowers or other organs arranged in a spike; also other flower-clusters resembling a spike.

Spice. Pleasant or pungent vegetable substances, used for flavoring food and condiments, such as mace, nutmeg, pepper and pimento. They owe their pungency and aroma chiefly to the essential oils they contain.

Spice Bush. See BENJAMIN BUSH.

Spice Islands. See MOLUCCAS.

Spicer, WILLIAM FRANCIS, U.S.N., 1820–1878. Captain 1870, Commodore 1877; lyric poet.

Spicheren. Village of Rhenish Russia, s. of Saarbruck; scene of a French defeat Aug. 6, 1870.

Spicula. Chitinous needle-shaped organs in the cloaca of nematode worms, that serve generative purposes; spiculum amoris.

Spicule. Small soft pointed appendages; also needle-like crystals in the cells of certain plants.

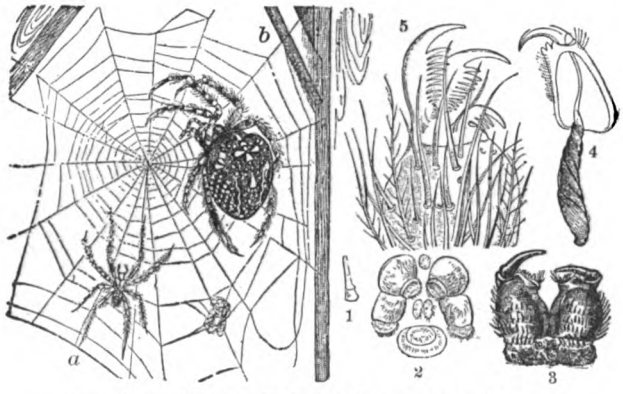
Spicules. Inorganic (sometimes organic) crystal-like bodies of usually regular shapes, secreted by the protoplasm of the cells of the lower Invertebrates to form a skeleton, as in Sponges, Holothurians and Sea-fans.

Spicule Systems OF SPONGES. The material may be crystalline carbonate of lime, colloidal silica, or spongin (keratin). They may have one axis and be uniradiate, or bi-

radiate, according as growth is in one or two directions, or have three axes, triradiate and sexaradiate, or four axes (tetraxonal), or finally be polyaxonal. The ends of the arms or rays may be sharp (oxeate), round (strongylate), knobbed (tylotate), spined, or branched (cladose), with two, three, four, or more branches (dicladose to polycladose); the branching may be repeated (dichocladose, etc.). Each system has also a number of modified forms due to excessive or lessened growth, curvature, etc., of one or more rays. The principal spicules are: stylus, rhabdus, triod, hexactine, calthrops, desma, triæne, spire, aster, cymba, trichite, rosette, dagger, pinnulus, amphidisk, anchor, uncinaria, scopularia, clavula, and staurus.

Spider Monkey (ATELES). S. American monkey, with long, strong, prehensile tail and long slender limbs, with rudimentary thumbs. It is greatly relished as food by the natives.

Spiders (ARANEIDA). To the Tetrapneumones belong the Trap-door spiders, which do not build a web but hide in tubes in the earth, from which they spring upon their prey. To the Dipneumones belong the *Saltigradæ*, which construct sacs in which they live by night and place their eggs; also the *Citigradæ*, with strong, long legs: these run about for their prey,



Cross Spider (*Epeira diadema*), male, *a*, and female, *b*.

1, Single pin-organ: 2, Spin-warts; 3, Lower jaw, claws, and eyes; 4, Left lower jaw cut open to show entrance to poison sac; 5, Outside point of a foot.

and hide under stones and boards; also the *Laterigradæ*, which spin only isolated threads: they run backward and sidewise while pursuing game. The *Tubitelæ* make tubes in connection with their webs. The *Inæquitelæ* spin irregular webs, in which they live. The *Orbitelæ* spin a regular, wheel-shaped web in the center of which they wait for prey. Spiders stand at the head of the Arachnids in point of intelligence.

Spiderwort. Plants of the genus *Tradescantia*, showy-flowered herbs of the natural family *Commelinaceæ*, natives of warm and temperate regions.

Spiegel, FRIEDRICH, b.1820. Prof. Erlangen 1849; writer on Persian linguistics and antiquities. *Eran*, 1863.

Spiegeleisen. See MANGANESE, METALLURGY OF.

Spielhagen, FRIEDRICH, b.1829. German novelist, well known in English translations. *Problematic Characters*, 1860; *Hammer and Anvil*, 1869; *Quisisana*, 1880; *Angela*, 1881; *Autobiography*, 1889–90.

Spiera, FRANCESCO, ab.1498–1548. Italian reformer, who was forced to recant and died of remorse for his apostasy.

Spiers, ALEXANDER, 1807–1869. English teacher in France; author of a dictionary of French and English, 1846–49, and several grammars.

Spike. Elongated flower-cluster with the individual flowers sessile, as in the PLANTAIN (q.v.).

Spikelet. Flower-cluster of grasses and sedges.

Spikenard. *Aralia racemosa.* Large perennial woodland herb of the natural family *Araliaceæ*, with aromatic roots, native of e. N. America; also, in India, *Nardostachys jatamansi*, herb of the Valerian family, its roots yielding a hair perfume.

Spikenard, FALSE. *Vagnera racemosa.* Woodland herb of the Lily family, native of N. America.

Spike-Rush. Grass-like plants of the genus *Eleocharis*, natural family *Cyperaceæ*, of wide geographical distribution. Their minute flowers are borne in solitary terminal spikelets.

Spiking. Disabling of a muzzle-loading gun by driving an iron spike into the vent. In breech-loading guns, a part of the breech mechanism is removed.

Spilling. In sinking mine shafts or driving levels, method of holding back loose or running ground by means of pointed poles or planks, called spills or spiles, forced into the ground in advance of the face of the workings.

Spinach. *Spinacia oleracea.* Esculent herb of the natural family *Chenopodiaceæ*, supposed to be native of Asia; long cultivated as a garden vegetable.

Common Garden Spinach (*Spinacia oleracea.*

Spinal Caries. See POTT'S DISEASE.

Spinal Column. Bony axis of support of the body of vertebrates. In man it consists of 24 true vertebræ (7 cervical, the first, called the atlis, articulates with the occipital bone of the skull; 12 dorsal, articulating with the ribs, and 5 lumbar); the sacrum, which is inserted between the hip bones; and the coccyx. These last two are made up of co-ossified segments, sometimes designated false vertebræ. Each vertebra consists of a disk-like body and a spine extending posteriorly, the attachment to the body being forked, thus making an opening which, in the jointed bone, forms the spinal canal. The spinal column is also known as the backbone.

Spinal Cord. Prolongation of the brain into the spinal canal. The spinal nerves emerge from the cord and are distributed to the trunk and both extremities. The spinal cord is the great conductor of nervous impulse to and from the brain, besides being the great organ of reflex action. Like the brain, it is made up of red and white matter.

Spinal Curvature. Deviation of the spinal column from its normal shape, more particularly the lateral deviations, since the normal column has no sidewise curves. It results in a deformity of the trunk, and is frequently caused by faulty position in sitting at tables or desks during childhood. This faulty method of sitting is often due to the size or shape of desk and chair.

Spinal Fluid, CEREBRO-. Serous liquid occupying the ventricles of the brain, and spaces between the arachnoid and pia-mater membranes of brain and cord; ab. 2 oz. Fluid of ventricles can pass through foramina in roof of fourth ventricle, and perineural lymph spaces also communicate with sub-arachnoid space. Brain is cushioned against the skull by this liquid, and when circulation increases in it some fluid passes into the spinal canal, owing to inelasticity of the cranial walls: but if fluid is abnormally increased during development, the bones yield and hydrocephalus results. After bones are knit, an abnormal increase causes coma; a sudden subtraction causes convulsions.

Spindle. Solid generated by a curve revolving about a chord perpendicular to the curve axis; classified according to the generating curve, parabolic, etc.

Spindler, KARL, 1796–1855. German novelist. *The Jew*, 1827; *The Invalid*, 1831. *Works*, 1831–54.

Spindle-Tree. Shrubs of the genus *Euonymus*, natural family *Celastraceæ*, with showy red fruits, natives of the n. temperature zone; much cultivated for ornament.

Spine, or THORN. Leafless branch, or portion of one, greatly hardened and attenuated, serving as an organ for defense.

Spinel. $MgAl_2O_4$. Mineral compound of alumina and magnesia, frequently occurring in bluish black opaque octahedrons, harder than quartz. The transparent and brilliantly colored varieties are much used as gems, especially under the name of ruby, or spinel ruby.

Spinelli, SPINELLO. ab.1332–1410. Italian painter of the 14th century of the Florentine School. He has a fresco in the Campo Santo of Pisa.

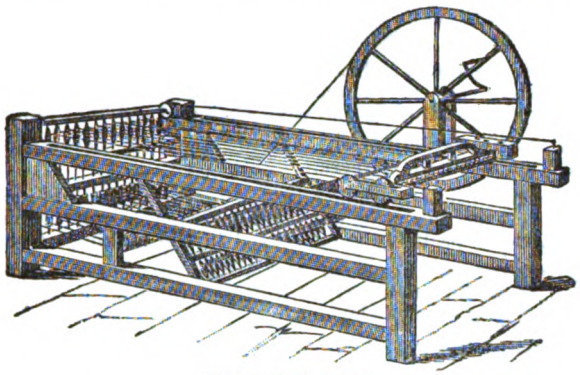
Spinet. See PIANOFORTE.

Spinner, FRANCIS ELIAS. 1802–1890. M.C. from N. Y. 1855–61; U. S. Treas. 1861–75. His well-known signature on bills was elaborated to render counterfeiting difficult.

Spinning. Twisting of minute filaments into a thread or yarn for weaving, sewing or rope making. It is of ancient origin, as shown by the pictures on Egyptian monuments. See DISTAFF and SPINNING-JENNY.

Spinning Glands. See SERICTERIA.

Spinning-Jenny. Machine with a number of spindles turned by one wheel or cylinder; invented by Jas. Hargreaves



Hargreaves' Jenny.

ab.1764; Arkwright invented the spinning-frame 1767, which was followed by the mule-jenny, superseding both, invented by Samuel Crompton 1774–79; all of England.

Spinola, AMBROSIO, MARQUIS DE, 1571–1630. Italian leader of condottieri in the Spanish service; commander in the Netherlands 1603–9 and 1621–25; pitted against Maurice of Nassau. He took Ostend 1604. Aix 1622, and Breda 1625, but was ruined by non-payment of his claims.

Spinola, FRANCIS B., 1821-1891. Brig.-gen. U. S. Vols. 1862–65; active in N. Y. politics; M.C. 1887.

Spinoza, BARUCH, or BENEDICT, 1632–1677. Dutch Jew, excommunicated 1656; philosopher of the Cartesian school. He asserted the existence of a single substance which he called God, and ascribed to it the two properties of thought

Baruch Spinoza.

and extension; all individual things and beings were modes of the Absolute. Chief works *Ethica*, 1665, tr. 1876; *Tractatus Theologico-Politicus*, 1670. His life was secluded and ascetic. He was the greatest and most famous of so-called pantheists.

Spinule. Diminutive of spine.

Spiracles. 1. Breathing pores or holes as found in the sides of many or all the joints of the body of Tracheates (insects). 2. Relic of the cleft between the mandibular and the hyoid arch in the lower fishes, often known as the spiracular cleft.

Spiral. Polar curve in which the radius vector is a non-recurrent function of the polar angle. The most noted spirals are the Archimedean, hyperbolic, and logarithmic.

Spiral Joint. Method of making a metallic pipe from a long sheet by riveting the edges together, so that the joints form a helical spiral.

Spiral Zoöids. Tentacle-shaped polyps in the *Hydractinia* colony.

Spiraster. Form of sponge spicule found in the genus *Thenea*. It consists of a short spiral axis covered with spines.

Spire. Arc of a spiral traced in one revolution of the radius vector.

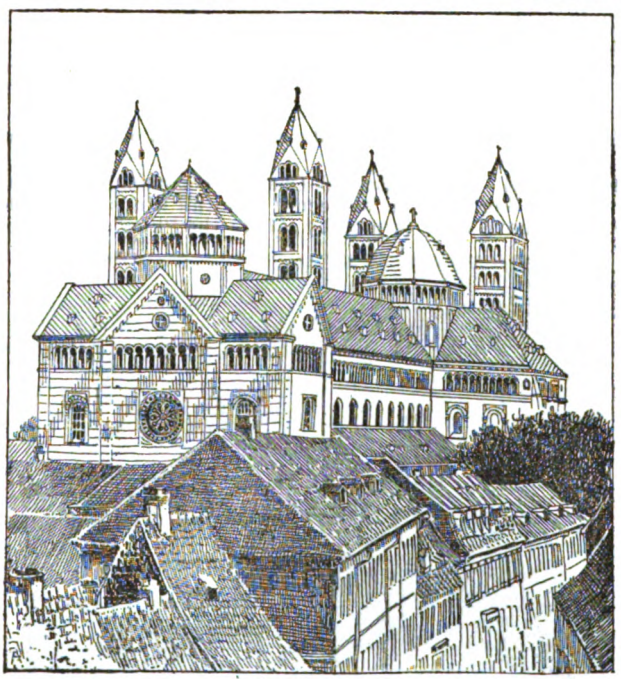
Spire. Form of sponge spicule which is of spiral shape. It may be simple, or may carry spines and branches. The spiral may be close or open; the varieties thus arising have distinct names.

Spire. Pointed termination of towers and turrets. In the Norman style, where they were first introduced, they were low; in the Early English they were somewhat higher; in the Decorated style they were very acute.

Spire. Tube made of some vegetable material, as straw, which, when filled with powder, can be used as a means of carrying fire to the charge in a hole drilled for blasting rock.

Spire. Turns above the body-whorl of a snail's shell.

Spires, or SPEYER. Capital of Rhenish Bavaria; on the Rhine; free imperial city 1294; many diets met here. That of 1529 revoked the permission given, 1526, to the princes to



Spires Cathedral.

regulate religious affairs. Against this act the reformers presented a protest; whence the term Protestant. Pop., 1890, 17,585.

Spirifer. Brachiopod having internal, spiral, calcareous framework for the support of its arms; Palæozoic, with one species surviving to the Lias. See TESTICARDINES.

Spirillum. Genus of corkscrew-shaped rigid bacteria that swim by rotatory movement.

Spirillum Choleræ Asiaticæ. See COMMA BACILLUS.

Spirit, HOLY. See HOLY GHOST.

Spirit, or SPIRITS. See ALCOHOL.

Spirit Blue. Mixture of salts of triphenylrosaniline and triphenylpararosaniline; green powders, insoluble in water, but soluble in alcohol; dyeing silk and wool blue; source for other colors. See NICHOLSON'S BLUE.

Spirit Colors. Artificial coal tar colors, soluble in alcohol, but insoluble or very slightly soluble in water.

Spirit Level. Instrument for determining the horizontality of a surface or line. It consists of a glass tube slightly curved and filled with alcohol, leaving a small bubble of air. This bubble always seeks the highest point. The tube is placed in a brass case with its convexity upward, and so ad-

justed that when the base is perfectly horizontal the bubble takes a position midway between two fiducial marks.

Spirit of Wine. See ALCOHOL.

Spirits of Hartshorn. See AMMONIA.

Spiritual Consanguinity. In R. C. theology, such relationship resulting among sponsors and administrators of baptism as voids intermarriages between them, without dispensation.

Spiritualism. Theory that consciousness has a subject other than the physical organism, and hence is the proper antithesis to materialism. It takes three radically distinct forms: (1) that the soul can materialize itself in physical forms through the agency of mediums, a conception based upon illusion and frauds; (2) that though materialization is impossible, there may be sporadic communications by telepathy or thought transference from a discarnate to an incarnate consciousness; (3) that there is an immortal soul, but no possible communication with the living. The last is the prevalent belief. The doctrine that a new revelation of truth and duty has come to mankind through spirits was first distinctly affirmed near Rochester, N. Y., 1848, by a family named Voss, later Fox.

Spiritus Fumans Libavii. See STANNIC CHLORIDE.

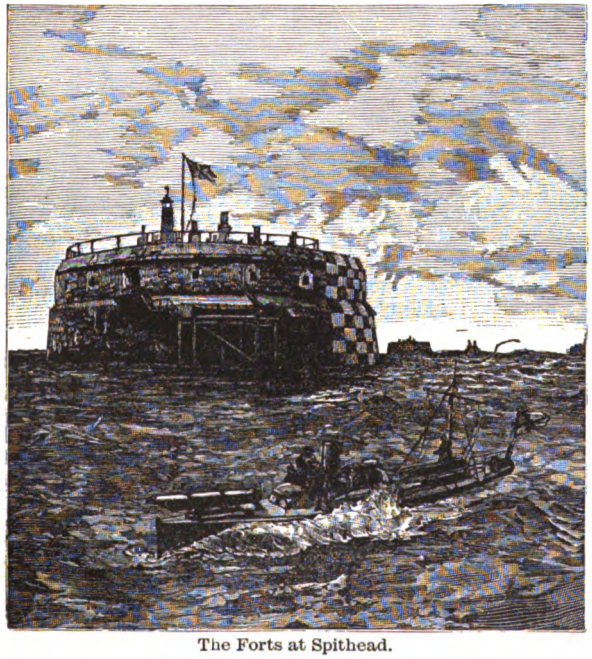
Spirochæte. Genus of spiral, flexible bacteria, swimming with rotatory motion.

Spirotrompe. Spiral proboscis formed of the antliæ in *Lepidoptera.*

Spirula. Cephalopod allied to *Argonauta*, having a nautilus-like coiled and chambered shell which is entirely internal, being lodged in the posterior part of the squid-like body.

Spite. An active desire to depress, mortify, or injure some one.

Spithead. Part of English Channel between Portsmouth and Isle of Wight. It is so secure from all winds except the s.e. as to have been termed by sailors the "king's bedchamber," and is the principal rendezvous of the British navy. There are circular forts on Horse, Norman and Sturbridge shoals. Portsmouth and Ryde are on its opposite sides. Length, n.w. and s.e., 2 m.; average breadth, 1½ m.



The Forts at Spithead.

Spitta, KARL JOHANN PHILIPP, D.D., 1801-1859. German hymnist. *Psalter und Harfe*, 1833-43, tr. 1860-64.

Spitting. The ancients considered spittle a charm against all kinds of fascination; the Romans believed that contagion could be repelled by spitting. Mungo Park tells of negroes spitting upon a stone as a charm at the beginning of a journey. In general, spitting has ever been regarded as a potent means of sorcery. Survivals of primitive notions regarding it are still common.

Spitz. Variety of Eskimo dog, common in the U. S. and Germany; mostly white.

Spitzbergen. Group of islands in the Arctic Ocean, n. of Norway; area ab. 27,000 sq. m.; discovered 1596 by Willem Barentz. They belong to Russia, and are uninhabited.

Spitzka, EDWARD CHARLES, M.D., b.1852. Prof. New York 1880-83. *Insanity*, 1883.

Splanchnology. Branch of Anatomy which treats of the digestive viscera. Comparative splanchnology treats of the homologous parts of the digestive system of different animals.

Splanchno-Skeleton. Hard structure developed in connection with the viscera.

Spleen. Ductless gland situated in the abdominal cavity to the left of the stomach. Its function is not certainly known, but it probably is concerned in the making of blood.

Spleenwort. Ferns of the genus *Asplenium*, bearing sporangia in elongated sori; of wide geographical distribution, most plenty in tropical regions.

Splenic Fever. Synonym for ANTHRAX (q.v.).

Splicing. See KNOTS AND SPLICES.

Spline. Rectangular groove cut in a shaft, into which fits a key on the hub of the driving or driven wheel. Both hub and key are a sliding fit on the shaft, and rotation of wheel and shaft must occur together, no matter to what point of the shaft the wheel may be slid. See KEY.

Splint. Piece of some rigid material, as wood, felt or metal, to be adjusted to a part to keep it in a fixed position by means of a bandage; *e.g.*, the keeping in position the fragments of a broken bone during the healing process.

Splint Coal. Hard variety of bituminous coal, that breaks up readily in the process of mining into large rectangular blocks or slabs.

Split. One of two or more parts into which a ventilating air current is divided in a mine.

Split Switch. One having the movable rails tapered so as to fit in close contact against the main rails.

Splügen. Alpine pass 6,946 ft. high, through which, in Dec. 1800, Macdonald led 15,000 men into Italy, with heavy losses by avalanches. A road was made 1810-22, and protected by galleries later.

Village of Splugen.

Spodumene. $LiAlSi_2O_6$. Mineral lithium aluminium silicate, nearly as hard as quartz and somewhat heavier. See HIDDENITE.

Spofford, AINSWORTH RAND, LL.D., b. 1825. Librarian of Congress 1864, Assistant Librarian 1897, and editor of several collections.—His brother, HENRY MARTYN, LL.D., 1821-1880, was a judge of La. Supreme Court 1854-58.

Spofford, MRS. HARRIET ELIZABETH (PRESCOTT), b.1835, m. 1865. American author, chiefly of short stories. *Amber Gods*, 1863; *Azarian*, 1864; *Ballads*, 1888.

Spohr, LUDWIG, 1784-1859. German violinist, composer, and conductor. Court chapelmaster at Cassel from 1822; previously traveling virtuoso of great renown throughout Europe, and still a living influence. Of his ten operas, *Faust* and *Jessonda* are still occasionally performed, as also one of his five oratorios, *Die Letzten Dinge*, and one of his nine sym-

phonies, *Die Weiheder Töne*. He also composed fifteen concertos for the violin, of which two, Nos. 8 and 9, have main-

Ludwig Spohr

tained great popularity. His *School for Violin-playing* is a classic. *Autobiography*, 1861.

Spoils System. That of appointments to office on mere partisan principles rather than with reference to fitness and the public good.

Spokane. Capital of S. co., Wash.; on the S.; settled ab. 1879; burned 1890. It has a large trade in lumber and flour. Pop., 1890, 19,992.

Spoleto. Italian town, 75 m. n. by e. of Rome; Roman colony 220 B.C.; notable for its ancient and mediæval remains. Pop. ab.7,700.

Spoliation. Mutilation of a legal instrument by one not a party to it. The legal effect is not thereby altered.

Spoliation Claims, FRENCH. These were for damages to American ships and cargoes by the French, before the treaty between the two nations, ratified 1801. They were estimated to amount to $20,000,000. The U. S. at that time assumed these claims; in 1885 a bill was passed by Congress referring the matter to the Court of Claims, and in 1891 a first appropriation of $1,304,095.37 was made to pay the findings of the court.

Sponges (PORIFERA). Animals whose bodies consist of amœboid cells imbedded in a gelatinous matrix hollowed out into chambers, into which inhalent canals open. The chambers open into a common exhalent canal or osculum. The simplest forms have only one chamber. An ectoderm is present in the young, and the chambers are lined by choanoflagellate

Diving for Sponges on the Coast of Syria.

cells. A skeleton of separate or united spicules, or of horny fibers, is usually present. Only one genus of the horny sponges have commercial value. Sponges are either monœcious or diœcious, and sometimes are viviparous. The sub-orders are: *Myxospongia* (gelatinous), *Ceraospongia* (horny), *Halichondriæ* (siliceous), *Hyalospongia* (glassy), and *Calcispongia* (calcareous). Sponges are prepared for commerce by rotting and washing away the animal matter, and then bleaching. These sponges come mainly from the Mediterranean and the Bahama Islands. See also PLETHOSPONGIÆ.

Spongiaria. See SPONGES.

Spongilla. See HALICHONDRIÆ, MONACTINELLIDÆ, and CARNEOSPONGIÆ.

Spongin, or SPONGIOLIN. See KERATODE.

Spongin Blasts. Special cells in sponges that secrete the substance of which the horny skeleton is formed. They are arranged into two sorts; one cluster secretes the axis (not true spongin) of the fiber which makes it grow in length; the others are on the sides of the fiber, and secrete the outer layers of true spongin.

Spongiole. Root-cap of plants; word now obsolete.

Spongomere. That part of a sponge which has the incurrent and excurrent canal system.

Sponsors. Godfathers and godmothers, who make the promises for the child at its baptism. In the R.C. Ch. one is sufficient, though more are usual; in that of England there should be three.

Spontaneity. Function of organic life by which it is capable of self-motion, or activity; contrasted with inertia, and sometimes identified with freedom, from which it differs in not necessarily implying the capacity for alternative choice.

Spontaneous Combustion. Combustion which takes place when no means are especially designed to produce that end. Substances which readily combine with oxygen cause spontaneous combustion. Mechanical division also increases it greatly. Rags soaked in linseed oil and damp charcoal powder are liable to take fire by oxidation in air.

Spontaneous Generation (ABIOGENESIS). Self-production of living matter from non-living matter, or of the organized from the unorganized. There is no evidence that any form of low life known to us originated in any other than a biogenetic way. All the evidence we have of the origination of living matter seems to show that the biogenetic law is absolute. It is to Biology what the law of the conservation of energy is to Physics or Chemistry. On purely philosophical grounds it is very doubtful if, strictly, spontaneous generation ever did occur, though it is generally assumed that life must have arisen through some evolutionary process. See PANÆSTHETISM.

Spontini, GASPARO LUIGI PACIFICO, 1774–1851. Italian opera composer and conductor, pupil of the conservatory at Naples and of Piccini. His operas were composed 1796–1829. From 1803–20, with a few interruptions, he was a power in the operatic affairs of Paris, and in Berlin 1820–40. He was Court Composer in France and Russia, and General Music Director in Prussia. His masterpieces are *La Vestale, Cortez,* and *Olympie.*

Spoonbills. 1. Ibis-like birds with long, large bills expanded at the end. *Platalea* is European and white; it nests

Spoonbill (*Platalea leucerodia*).

in trees or among reeds. *Ajaja* is the Roseate Spoonbill of the warmer parts of America. 2. Siberian Sandpiper. 3. Shoveler duck and Ruddy duck. 4. A genus of Sturgeons.

Spoonwood. See LAUREL, MOUNTAIN.

Sporades. Islands of the Ægean Sea, excluding the Cyclades; especially those near Asia Minor, from Samos to Rhodes.

Sporadic. Diseases which supervene indifferently in every season and situation, from accidental causes, and independently of any epidemic or contagious influence.

Sporange (SPORANGIUM). Spore case. The term is much employed in cryptogamic botany.

Sporangiophora. Sub-class of *Mucorinæ*.

Sporangiophore. Support or stalk of a sporange.

Spore. Specially modified vegetable cell, which, becoming detached from the parent plant, may grow directly or indirectly into a new individual; propagative bodies of the lower plants, as Ferns, Mosses, *Fungi*, and *Algæ*.

Spores of Bacteria. The majority of bacteria have a stage during which they are actively growing and splitting up by binary fission. In this stage a moderate heat is sufficient to kill them, 60° C. acting for 15 minutes. This is the vegetative stage. At other times cells are produced that can stand drying up, withstand steam at 100° C., and a dry heat of nearly 150° C. This power is in part due to their small size, and in part to special coats around the germ, which when the spore sprouts again are split open like a seed-coat. Two sorts of spores are produced: (1) arthrospores, (2) endospores, the latter being the smaller. Spores are produced when the bacterium forms a zoöglœa. Spores are very resistant to staining.

Sporidiifera. See SPOROCARPEÆ.

Sporids (SPORIDIA). See ZOÖSPORES.

Sporifera. Division of *Fungi*, characterized by bearing naked spores; *i.e.*, not inclosed in sporocarps.

Sporocarp. Conceptacle containing sporanges or spore-cases, as in many *Fungi*.

Sporocarpeæ. Division of *Fungi*, characterized by bearing their spores in sporocarps or sacs; also known as *Sporidiifera*.

Sporocladium. Spore-bearing branches in *Thallophyta*.

Sporocyst. Mother-cell from which spores are formed; sporocyte. See DISTOMUM.

Sporoderm. Cell-wall of a spore.

Sporodochium. Spore-bearing structures.

Sporogen. Spore-producing plant; term rarely used.

Sporogenesis. See SPOROGONY.

Sporogone (SPOROGONIUM). Fertilized oösphere of the *Bryophyta* and *Pteridophyta*.

Sporogony (SPOROGENESIS). Form of Monogenesis, in which reproduction takes place by spores. Either one or several spores may result from one cell, monosporogony and polysporogony.

Sporophore. Any portion of the mycelium of a fungus, developed for the bearing of propagative spores, as the cap of a toadstool.

Sporophyll. Leaf, or portion of a leaf, of a fern or other *Pteridophyte* which bears spores. Term also applied to the anther.

Sporophyte. Asexual generation of *Pteridophyta;* as the spore-bearing portions of ferns, club-mosses, etc.

Sporosac. Generative bud of a Hydroid, which never completely attains the structure of a medusa.

Sporozoa (LIPOSTOMA, GREGARINIDEA). Class of corticate *Protozoa*, including the *Gregarinidæ*, *Coccidiidea*, *Myxosporidea*, and *Sarcocystidea*.

Sport. In Botany and Zoölogy, sudden variation in an organ or organism.

Sports. Amusements of all kinds, but more particularly those pursued in the open air, as hunting, fishing, riding, and athletic games.

Sports, BOOK OF. Declaration of James I., 1618, recommending dancing, archery, and other recreations as proper on Sundays after service; renewed by Charles I. 1633; aimed at the Puritans, and detested by them; burned by order of Parliament 1644.

Sporule. In Mycology, small spores.

Spotswood, ALEXANDER, 1676–1740. Gov. of Va. 1710–22; explorer of the mountain region 1716; he built an iron furnace ab. 1715; Deputy Postmaster-gen. of the Colonies 1730–39. *Letters*, 1882–85.

Spotted Fever. See MENINGITIS.

Spottiswoode, or **Spotswood,** JOHN, 1565–1639. Abp. of Glasgow 1603; Abp. of St. Andrews and Primate 1615; Chancellor of Scotland 1635–38; ejected 1638 for introducing the liturgy. *Hist. Ch. of Scotland*, 1655.

Spottiswoode, WILLIAM, LL.D., D.C.L., F.R.S., 1825–1883. English printer and mathematician. *Polarization of Light*, 1874.

Spotts, JAMES HANNA, U.S.N., 1822–1882. Commander 1862, Captain 1866, Commodore 1873, Rear-admiral 1881.

Spottsylvania. In Va., 55 m. n. by w. of Richmond; scene of battles May 8–18, 1864. The Union loss was 4,170 killed, 19,680 wounded; the Confederate, ab. 1,000 killed, 5,000 wounded.

Sprag. Piece of wood used to block the wheels of a mine car on a down grade, so as to substitute sliding for rolling friction.

Sprague, CHARLES, 1791–1875. American poet.

Sprague, PELEG, LL.D., 1793–1880. M.C. from Mo. 1825–29; U. S. Senator 1829–35; U. S. Judge for Mass. 1841–65. *Speeches*, 1858; *Decisions*, 1861.

Sprague, WILLIAM, 1799–1856. M.C. 1835–37; Gov. of R. I. 1838–39; U. S. Senator 1842–44.—His nephew, WILLIAM, b.1830, was Gov. of R. I. 1860–63 and U. S. Senator 1863–75.

Sprague, WILLIAM BUEL, D.D., LL.D., 1795–1876. Presb. pastor at Albany 1829–69. His *Annals of the American Pulpit*, 10 vols., 1856–76, is a monumental work, invaluable as a thesaurus of clerical biography.

Sprain. Injury caused by too great traction on a part. The usual seat is in the ligaments of a joint, as the ankle joint, but a muscle or its tendon may also be sprained. The degree of the injury varies from a mere over-extension, which is quickly recovered from, to a rupture of some of the fibers of the part, making a serious injury. Surrounding the injured part with an abundance of water, as hot as can be borne, is one of the best methods of relieving the pain and removing the congestion. The water should be kept hot, and applied for some considerable time.

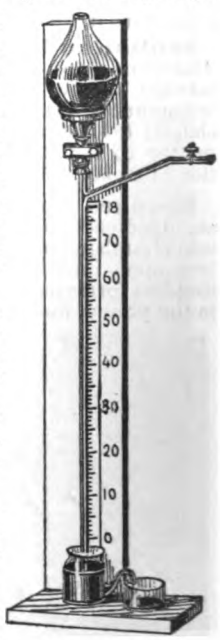
Spreader. In mine timbering, extra piece put in to keep the legs of a set of timber in position.

Spree. River rising in n.e. Saxony, and flowing n. and n.w. through Prussia and Berlin, to the Havel, a branch of the Elbe. Length 227 m., drainage area 3,655 sq. m.

Sprengel, HERMANN JOHAN PHILIPP, F.R.S., b.1834. German-English chemist, inventor of explosives, hellhoffite, rackarock and picric acid mixtures.

Sprengel, KURT, 1766–1833. Prof. of Botany at Halle from 1789. *Geschichte der Arzneikunde*, 5 vols., 1792–1803; *Kenntniss der Gewächse*, 1802–4, tr. 1807; *Historia rei herbariæ*, 1807–8; *Geschichte der Botanik*, 1817–18; *Jahrbücher der Gewächskunde*, 1818–20; *Umfang der Pflanzenkunde*, 1820–22.

Sprengel Pump. Apparatus devised by H. J. P. Sprengel 1861, for automatically exhausting a vessel of air or other gas. It consists in its simplest form of a long vertical tube provided with a side branch opening into the tube at 45° and communicating with the vessel to be exhausted. The top of the tube is connected with a supply vessel filled with mercury, which is allowed to pass down the tube, passing the open end of the branch. Bubbles of gas thus become entangled between the drops of mercury and are carried down with the column. The length of the tube below the side branch must be more than 30 in.



Sprengel Pump.

Sprenger, ALOYS, 1813–1893. Austrian Orientalist, in India 1843–57; prof. Berne 1857. *Leben und Lehre des Mohammed*, 1861–65; *Alte Geographie Arabicus*, 1875; *Babylonien*, 1886.

Sprenger, JACOB. German inquisitor 1484; author, with H. Krämer, of *Malleus Maleficarum*, 1489, concerning witchcraft and its punishment.

Spring, GARDINER, D.D., 1785–1873. Presb. pastor in New York from 1810. *Works*, collected in 10 vols., 1855; *Reminiscences*, 1866.

Spring, LEVERETT WILSON, D.D., b. 1840. Prof. Univ. Kansas 1881–86, and Williams Coll. from 1886. *Mark Hopkins*, 1885; *Kansas*, 1888.

Spring. Most of the rain water and snow falling upon the land sinks into the ground or evaporates, a small proportion flowing by brooks and rivers to the sea. This ground water percolates through the soils and rocks and accumulates in porous strata, the pressure of the descending column forcing it through fissures to the surface, at a lower level, where it issues, forming springs. Rain water carries into the soil the gases dissolved in the atmosphere, including oxygen, nitrogen, and carbon dioxide, the suspended dust and ammonium nitrate, all in very small quantities. As the water percolates the soil and rock it dissolves also more or less organic and mineral matter, depending upon the solubility of the constitu-

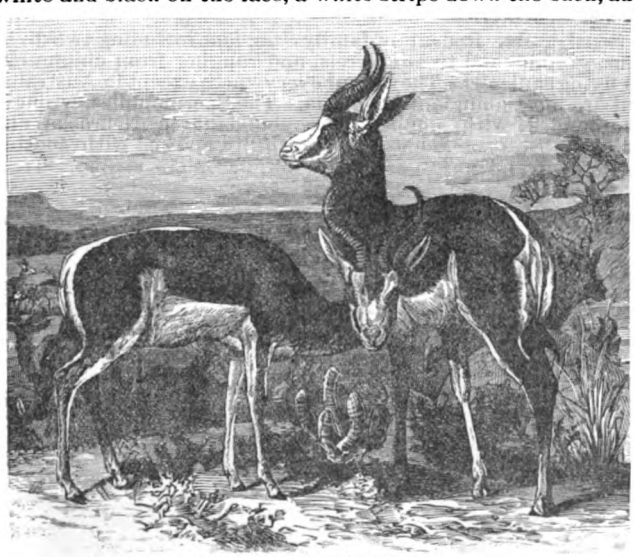
ents and the thickness of the strata. From siliceous rocks the water may contain as little as a grain of mineral matter to the gallon, from a limestone as much as 50 grs. Spring waters have the temperature of their source, and are generally cooler than surface waters; when derived from great depths or in volcanic districts, they may be warm or hot. Saratoga springs are ab. 50° F.; at Hot Springs, Ark., they range from 95° F. to 150° F.; in the Yellowstone Park, the temperature reaches 200° F. Ordinary spring waters have dissolved in them calcium and magnesium carbonates, sulphates and chlorides, sodium chloride and silica, with some organic matter of vegetable origin. The term mineral spring is applied to extraordinary waters which contain mineral matter with hygienic, curative or other valuable or useful qualities. Saline springs contain common salt and other chlorides and sulphates, in Michigan 20 grs. per gal.; Epsom spring, Eng., contains magnesium sulphate. Acidulous springs contain carbon dioxide, which renders them effervescing, and alkaline carbonates in solution. Saratoga springs contain as much as 250 grs. per gal. of the latter, with 500 grs. of sulphates. Chalybeate springs contain iron, the Pavilion spring, at Saratoga, contains 0.8 grs. per gal. Sulphur springs contain sulphur in the forms of sulphureted hydrogen gas and alkaline sulphides, Richfield, N. Y., springs contain ab. 2 grs. per gal. in these forms, and the sulphur springs of Virginia are also strong. Siliceous springs contain silica, especially the geysers. The Rockbridge alum springs contain as much as 72 grs. per gal. of aluminium sulphate. A spring in Cornwall, Eng., contains 26 grs. of lithium carbonate per gal. Near Borax Lake, Cal., is a spring containing 108 grs. per gal. of ammonium bicarbonate, and in the same region a spring with 103 grs. per gal. of borax. Artificial springs are made by boring down through the earth until a water bearing stratum is found. The result is very uncertain both as to the quality and quantity of water obtained. See GEYSER, INTERMITTENT SPRING and ARTESIAN WELL.

Spring-Balance. This consists of a coiled steel spring in a metallic case: the upper end is fixed to a ring at the top, by which it is suspended; to the lower end a rod is fastened, with a pointer extending through a slot upon a graduated scale. To a hook at the lower end the article to be weighed is attached. See JOLLY'S BALANCE.

Spring-Beauty. Showy-flowered vernal herbs of the genus *Claytonia*, natural family *Portulacaceæ*, natives of the n. hemisphere.

Spring-Beetle. See ELATERIDÆ.

Springbok (GAZELLA EUCHORE). S. African antelope, with white and black on the face, a white stripe down the back, and



Springbok (*Gazella euchore*).

white on belly. It has a habit of springing vertically upward before taking flight. It has been much hunted, and is scarce. See ANTELOPIDÆ.

Springer. Point at which an arch unites with its support; also the bottom stone of the coping of a gable.

Springer, WILLIAM MCKENDREE, b.1836. M.C. from Ill. since 1875.

Springfield. Capital of Clarke co., Ohio; on Mad River, 80 m. n.e. of Cincinnati; seat of Wittenberg College; noted for its extensive manufactures of farm tools. Pop., 1890, 31,895.

Springfield. Capital of Greene co., Mo.; in the Ozark Mts.: of recent growth; seat of Drury College. Pop., 1890, 21,850.

Springfield. Capital of Hampden co., Mass., on the left bank of the Connecticut; settled 1636 as Agawam; burned by Indians 1675; chartered 1852. Its manufactures are considerable and varied. The U. S. arsenal and manufactory of small arms was founded 1794. Pop., 1890, 44,179.

Springfield. Capital of Ill. since 1837 and of Sangamon co. since 1823; 185 m. s.w. of Chicago; chartered 1832 and 1840; home of Pres. Lincoln; center of a bituminous coal region. Pop., 1890, 24,963.

Springfield Rifle. Made at U. S. armory, Springfield, Mass.; used by the army from the rebellion until 1892, when it was superseded by the Krag-Jörgensen rifle. The breech of the Springfield rifle is closed by a block which rotates about a hinge on the forward upper surface, and is attached to the receiver at the rear of the barrel. A firing-pin passes through the block, and a stroke of the hammer forces it against the cartridge. When the block is closed it is locked in place by a cam latch at its rear end.

Spring Fog. Fog that forms over the ocean in certain localities in the n. Atlantic in the spring; due to the cooling at night of warm moist s. winds blowing over cool land and water near the shore.

Spring Gun. Gun so arranged that when a person or animal in any way touches the wires which are fastened to the trigger it will wound them. Illegal in Britain since 1827, except when set indoors.

Spring of the Air. Elasticity of the air; so called by Boyle 1660, and by others until ab.1750.

Springs. Elastic bars of metal to absorb shocks or to store up mechanical work that it may be given out when the equilibrium of the bar is restored. Springs are either spiral, helical, or flat. The strain which distorts them may be a push or a pull, and the strain in the bar is usually torsion or flexure. For compression in buffers and for car-springs rubber has been used. Compressed air is used in some machines.

Springs of Action. Such appetites and desires as stimulate the will into action.

Spring Tides. These occur when the sun and moon are in conjunction or opposition, at the new or the full moon: as their tide-raising action is then combined, the difference between high and low water is a maximum.

Sprouting. See BUDDING.

Spruce. Coniferous evergreen trees of the genus *Picea*, natives of the n. hemisphere; much planted for ornament. The white and black spruce are cut for timber in the U. S.

Spruce, STRENGTH OF. The ultimate tensile strength is ab. 10,000, and the ultimate compressive strength ab.5,000 lbs. per sq. in. of cross-section.

Spruce-Beer. Sugar and water are fermented by yeast, and essence of spruce and spices are added; a pound of sugar to a gallon of water.

Spudding. 1. Pipe driven from the surface down to rock in order to drill a hole in the latter. 2. Preliminary operations of drilling the first few feet of an oil-well, in order to get depth enough for the advantageous handling of the regular string of tools.

Spuller, EUGÈNE. 1835–1896. French journalist, ally of Gambetta; Deputy 1876; Minister of State 1881–82, 1887, and 1889–90; Senator 1892. *Second Empire,* 1870; *Loyola,* 1876; *Michelet,* 1876; *Conférences,* 1879–81.

Spur. Mediæval mark of knighthood, the spurs of knights being of gold, while those of squires were of silver. The degradation of a knight consisted in hacking the spurs from his

Various kinds of Spurs.

1, Bronze prick spur found at Linlithgow Palace; 2, iron spur found near Bannockburn; 3, bronze spur found at Colchester; 4, brass spur found at Culloden; 5, spur found at Halidon Hill; 6, spur found in making a drain in High Street, Edinburgh.

heels. Spurs are still worn on the heel by cavalrymen and other riders to urge horses to greater speed. The modern spurs, having only minute serrations, are not as cruel as the spiked spurs of former times.

Spur. Elongated hollow appendage to a petal, sepal, calyx or corolla.

Spur. Small offshoot or branch from a main vein of ore.

Spurge. Herbs and shrubs of the genus *Euphorbia*, natural family *Euphorbiaceæ*, of wide geographical distribution, including some common weeds.

Spurge-Laurel. *Daphne laureola.* Evergreen shrub of the natural family *Thymeleaceæ*, native of Europe; cultivated for ornament.

Spurge-Nettle. See TREAD-SOFTLY.

Spurgeon, CHARLES HADDON, 1834–1892. Baptist preacher in London from 1853, and from 1861 at the Metropolitan Tabernacle, where he had an immense audience; founder of many chapels, an orphanage, and a pastors' college; ed. *Sword and Trowel* from 1865; author of over 100 vols. By voice and pen he exerted enormous influence. *John Plowman's Talk*, 1868; *Treasury of David* (on the Psalms), 7 vols., 1865–80; *Storm Signals*, 1886.

Spurious Disks OF STARS. Small disks which fixed stars show when viewed with a telescope. As the diameter of the disk is not increased by increasing the magnifying power, it does not belong to the star. See DIFFRACTION OF OBJECT-GLASS.

Spurn Head. Cape on the coast of the e. Riding of Yorkshire, at the n. extremity of the estuary of the Humber.

Spurrey. *Spergula arvensis.* Low spreading herb of the natural family *Caryophyllaceæ*, native of Europe, introduced as a weed into America.

Spurs, BATTLE OF. 1. At Courtray, Belgium, July 11, 1302. Robert, Count of Artois, was defeated and slain by the Flemings. 5,000 gilt spurs were collected from the battlefield. 2. Battle at which Henry VIII. of England defeated the Duc de Longueville at Guinegate, Aug. 16, 1513; so styled from the fact that the French used their spurs rather than their swords.

Spurzheim, GASPER. 1776–1832. Pupil of GALL, F. J. (q.v.), and his associate 1805–13 in preaching the new doctrines of PHRENOLOGY (q.v.), which he later introduced by voice and pen in England and France.

Sputum. Secretion ejected from the mouth by spitting. Normally it consists of saliva and the mucous secretion of the posterior nares and fauces. In diseased conditions other secretions are added, as of the bronchial tubes in bronchitis. In some of the communicable diseases the sputa contain the germs of the disease, and care should be taken to disinfect them. This is especially true of consumption and diphtheria.

Spuyten Duyvil Creek. Narrow channel connecting Hudson River with Harlem River, and thence with East River on Long Island Sound; Harlem River Ship Canal by way of Spuyten Duyvil Creek and Harlem River was opened 1895, 15 ft. deep; cost was $2,700,000.

Spy. In war, a person employed to secretly obtain information regarding the movements and condition of the enemy. When captured they are usually hanged or shot. Political spies have been employed by many governments, both within their own domains and in foreign countries; Russia has an extensive system in both these directions.

Squails. Modification of the game of Shuffle Board, played by 4 or 6 persons, with disks of wood numbered or colored to distinguish them. The players sit around a smooth top-table, in the center of which is a short metal column called the Process. The squails are placed so that their edge projects over the table, and played toward the process by striking with the palm of the hand. The object is to get as near the Process as possible.

Squali (SQUALIDES). See SHARKS and PLAGIOSTOMI.

Squall. Short burst of violent wind, usually accompanied by rain.

Squalordontidæ. See MONODONTIDÆ.

Squama. In Botany, scale.

Squamariaceæ. Order of small red *Algæ*.

Squamata. See LEPIDOSAURIA.

Squarcione, FRANCESCO, 1394–1474. Paduan art professor, prominent in the early Renaissance as collector and academician. Teacher of Mantegna.

Square. Equilateral rectangle.

Square of Slate. Roofing slates are sold by the square, which is a quantity sufficient to cover 100 sq. ft. of roof. For slates 12x24 in., 114 make a square; for those 8x16 in. 277.

Square Root. One of two equal factors of a quantity. See INVOLUTION.

Squares, METHOD OF LEAST. See LEAST SQUARES.

Squash. Fruit belonging to one of the several species of *Cucurbita*. See CUCURBITACEÆ.

Squash-Bug (ANASA TRISTIS). Beetle ½ inch long, dark brown above, dull yellow beneath. The female lays eggs glued together on the under sides of leaves. They cause wilting. The remedy is to pick them by hand and destroy.

Squatinidæ. Family of Sharks, including the Angel fishes; so called from their large expanded and wing-like pectoral fins. They grow to a length of 5 ft., and resemble the Rays both in general appearance and their habit of feeding on the bottom. Their appearance is repulsive.

Squatter Sovereignty. In U.S., the principle of leaving to the settlers of the Territories themselves whether slavery should be permitted by the constitutions to be adopted when the Territories were admitted into the Union. See KANSAS.

Squaw-Root. See CANCER-ROOT.

Squaw-Weed. See RAGWORT.

Squeeze. Gradual settling of the roof of a coal mine after a portion of the coal has been worked out.

Squib. Piece of quill or straw, or paper tube, filled with powder and used to communicate fire to a blasting charge. See SPIRE.

Squid. See LOLIGO.

Squier, EPHRAIM GEORGE, 1821–1888. U. S. Chargé to Central America 1849–50; Commissioner to Peru 1863–65; eminent for archæological researches in those countries; first pres. Anthropological Society 1871. *Nicaragua*, 1852; *Serpent Symbols*, 1852; *Central America*, 1854–57; *Waikna*, 1855; *Peru*, 1877.

Squill. *Scilla maritima.* Bulbous herb of the Lily family, native of the Mediterranean region, yielding a valuable drug.

A, *Scilla verna;* B, Officinal Squill (*Scilla maritima*): *a*, plant with flowering scape in blossom; *b*, plant with full-grown leaves.

Squilla. See STOMATOPODA.

Squinch. In Gothic Architecture, small arches across angles of towers to support alternate sides of octagonal spires.

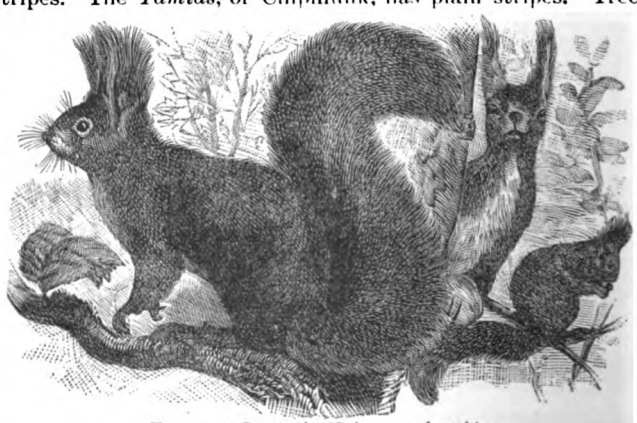
Squint, or HAGIOSCOPE. Aperture made in the interior walls of a church, generally in the sides of the chancel arch, to enable persons in the aisles, or side chapels, to see the elevation of the Host.

Squinting. See STRABISMUS.

Squire. In U. S., local judge or justice of the peace; in England, a country gentleman.

Squirrel Corn. *Bicuculla canadensis.* Low rose-flowered herb of the natural family *Papaveraceæ*, native of woodlands in n.e. N. America.

Squirrels. Rodents of family *Sciuridæ*, including two divisions, ground- and tree-squirrels, and ranging from chipmunks to flying squirrels. They occur everywhere except in Australia, but are most abundant in s. Asia. The Spermophiles, wrongly confounded with gophers, are abundant in Nebraska and adjacent States. Some are beautifully marked with spotted stripes. The *Tamias*, or Chipmunk, has plain stripes. Tree-



European Squirrels (*Sciurus vulgaris*).

squirrels have bushy tails. In U. S. are six species, with great variation of color. The Fox Squirrel is a foot long, and its tail as much more; it is gray, with red and black varieties. The Gray Squirrel, 10 in. long, and tail 13 in., also has a black variety. The common Red Squirrel, *Sciurus hudsonius*, also called Chickaree, is ab. 8 in. long, and tail 6 in. In Africa is the Hedgehog Squirrel, with Porcupine-like spines.

Squirrel-tail Grass. *Hordeum jubatum.* Common grass of n. central N. America.

Srinagar. Capital of Cashmere, n. India; on the Jhilam, near 5,300 ft. above the sea; noted for beauty of situation. Pop., 1891, 120,340.

Staal, MARGUERITE JEANNE (CORDIER DELAUNAY), BARONESS DE, 1684-1750. French author of *Memoirs*, 4 v., 1755. *Works*, 1821.

Stabat Mater. Latin hymn on the griefs of the Virgin Mary; doubtfully credited to Jacoponus (Jacobus de Benedictis), d.1306, and by some to Pope Innocent III., d.1216. It has frequently been set to music, the most celebrated settings being those of Palestrina, Astorga, and Pergolese.

Stability of Solar System. Laplace and Lagrange showed that the mutual perturbations of the system could never produce any material permanent changes; therefore it is stable.

Stable Equilibrium. Condition of equilibrium such that, if the body be slightly moved by an extraneous force, it returns to its original condition when that force is removed. See EQUILIBRIUM.

Stack. CHIMNEY (q.v.), especially of sheet-iron for locomotive boilers. Locomotive stacks for wood-burning engines are inverted cones with a fine gauze over the top to arrest flaming sparks which would be expelled by the draft. The casing is often double, with deflectors to throw cinders into the annular space between linings, whence they can be removed after the run. For coal, with the extended smoke-box (see LOCOMOTIVE) and the netting below, the straight stack is more usual. Without the extension, the diamond stack has a double cone enlargement near the top, the area of the large bases giving a sufficient open area for the netting, so that it may arrest sparks and not cause too great resistance. Besides the draft from the exhaust, such stacks have a steam jet blower, to compensate for their low height when the engine is still.

Stackhouse, THOMAS, 1680-1752. Anglican author of a *Body of Divinity*, 1729, and *Hist. Bible*, 1732, repub. 1836.

Stackhousiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 2 genera and ab. 20 species, confined to Australia and the neighboring islands.

Stadia Measurement. Method of measuring distances by reading the space intercepted on a vertical rod between two horizontal wires in the telescope of a surveyor's transit. The distance of the rod from the instrument is proportional to the space seen on the rod, and this is properly graduated so that the former can be directly read. If inclined distances are required, computations or tables are needed to obtain the horizontal distances and the differences of elevation. The method was devised by Porro, an Italian engineer, ab.1840, and is now extensively used in topographic surveying. It is not as accurate as measurements by a chain or tape but is more rapid.

Stadion, JOHANN PHILIPP KARL JOSEPH, COUNT, 1763-1824. Austrian Ambassador to Sweden, England, and Russia; Minister of Foreign Affairs 1806-9 and 1813.

Stadium. 1. Greek measure of distance, ab. ⅛ of a mile. 2. Course for foot-races, at Olympia, Athens, and elsewhere.

Stadtholder. Chief officer of the Dutch Republic till 1802; title of William the Silent, and of his son Maurice; originally viceroy of the Spanish king in any Dutch province.

Staël-Holstein, ANNE LOUISE GERMAINE (NECKER), 1766-

Baronne de Stael-Holstein.

1817. French author; married to the Swedish Ambassador 1786; in exile 1792-97 and 1803-15, mostly at Coppet near Geneva; hated and persecuted by Napoleon. Her salon was the most brilliant in Paris; her literary repute and social influence were great. Besides the novels *Delphine*, 1802, and *Corinne*, 1807, her chief works are *Letters on Rousseau*, 1789; *Literature and Social Institutions*, 1800; *De l'Allemagne*, 1810; *On the French Revolution*, 1818; *Ten Years of Exile*, 1821.—Her son, AUGUSTE LOUIS, BARON VON, 1790-1827, wrote *Letters from England*, 1826. *Works*, 3 vols., 1829.

Staff. Body of officers attached to the headquarters of a commanding officer to assist him in the military administration of his command. In the U. S. service the general staff comprises the various departments and corps which constitute the bureaus of the War Department: the adjutant-general, inspector-general, judge-advocate-general, quartermaster, subsistence, medical, pay, and ordnance departments, the corps of engineers and the signal corps. Control of the army is exercised by the Secretary of War through these bureaus, and the adjutant-general is the official channel by which orders are promulgated and correspondence conducted. The staff of a military department comprises officers of the general staff departments or corps assigned by the Secretary of War. The staff of a general officer consists of the aides-de-camp authorized by law, namely, three to a major-general, from the captains or lieutenants of the line, and two to a brigadier-general from the lieutenants. Regimental staff comprises the adjutant and the quartermaster: these are appointed by the colonel, subject to approval of the Secretary of War, and hold office for four years, selection being restricted to the lieutenants on duty with the regiment. The non-commissioned regimental staff consists of the sergeant-major and the quartermaster-sergeant. See OFFICERS, STAFF.

Staffa. Scottish islet, w. of Mull and n. of Iona; area 71 acres; noted for FINGAL'S CAVE (q.v.).

Staffeldt, ADOLF WILHELM SHACK, 1769-1826. Danish poet.

Stafford, WILLIAM HOWARD, VISCOUNT, 1612-1680. Victim of Titus Oates; beheaded for alleged complicity in the Popish Plot.

Staff-Tree. See BITTERSWEET.

Stag. Red-deer of Europe and Asia. Height at shoulder 4 ft., length 7 ft., of male; female much smaller. The horns (present in male) are beautiful; the brow antler turns forward and upward, making a dangerous weapon. An old stag is known as a hart; the hinds are mature at 3 years, but not the stags. The young animals go in herds, the old are solitary. The period of gestation is ten months.

Stag-Beetle. *Lamellicornia* of the genus *Lucanus*, which have branched mandibles resembling the antlers of a stag. The European variety is black in color and often 2 in. long. It is supposed by some to be the *Cossus* of the Romans, much esteemed by them as a delicacy.

Stage. In Gothic Architecture, the spaces between the setoffs of buttresses.

Stage. See DRAMA, THEATER, and INTERNATIONAL CONGRESS.

Stagger-Bush. *Pieris mariana.* White-flowered shrub of the natural family *Ericaceæ*, native of the e. U. S.

Staggers (OF SHEEP). Disease characterized by loss of appetite and flesh; the animal acts stupidly, and has jerky irregular movements, perhaps walking in a circle. The symptoms are caused by the presence in the brain of the young tapeworms of the dog (*Tænia cœnurus*). These are taken with the food, soiled by droppings from the dog. The dog gets these parasites by eating the brains of sheep. Hence care should be taken with animals having this disease.

Staghorn-Fern. *Platycerium alcicorne*, and other ferns of the same genus, bearing branching, divided leaves resembling the antlers of a stag, with other broad cup-shaped ones at the base of the plant.

Staghound. Large, wiry-haired dog, similar to the greyhound, but with more bone and power. It is supposed to be a cross between the bloodhound, which it rivals in power of scent, and the greyhound; used to hunt the stag in Europe and the antelope in the w. U. S. See HOUNDS.

Stagirite. Aristotle; so called from his birthplace, Stagira in Macedonia.

Stagnelius, ERIK JOHAN, 1793-1823. Swedish epic, lyric, and dramatic poet. *The Martyrs*, 1821.

Stahel, JULIUS, b.1825 in Hungary. Brig.-gen. U. S. Vols. 1861; Major-gen. 1863-65; U. S. Consul in Japan 1866-69 and 1877-85.

Stahl, FRIEDRICH JULIUS, 1802-1861. Prof. at Erlangen 1832 and Berlin 1840; writer on law and politics; extreme reactionary. *Philosophie des Rechts*, 1830-37; *Der Christliche Staat*, 1847.

Stahl, GEORG ERNEST, 1660-1734. Prof. of Chemistry and

Medicine at Halle 1693; royal physician 1716; father of the Phlogiston theory.

Stahr, ADOLF WILHELM THEODOR, 1805–1876. German art critic. *Lessing*, 1859, tr. 1866.

Staigg. RICHARD MORRELL, 1817–1881. Anglo-American painter, chiefly of portraits.

Stained Glass. Painted glass in windows was first used in France, at Le Mans in 11th century; in England, at Canterbury in 12th century, the greater part in 15th century. See GLASS.

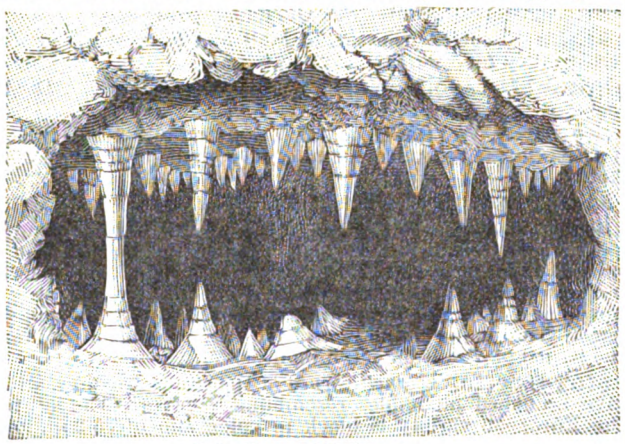
Stainer, JACOB, 1621–1683. Tyrolese maker of violins, formerly of high repute.

Stainer, SIR JOHN, b.1840. English organist and composer, knighted 1888; Prof. of Music at Oxford 1889. *Dictionary of Musical Terms.*

Stair, JAMES DALRYMPLE, VISCOUNT, 1619–1695. Scottish lawyer; lord of Session from 1657, pres. Court of Session 1671–81; in Holland 1682–88; Viscount 1690. *Institutions of the Law*, 1681; *Decisions*, 1683–87.—His son, JOHN, "Master of Stair," 1648–1707, Lord-advocate 1685, Sec. of State 1691–95, Viscount 1695, and Earl 1703, is infamous as author of the massacre of Glencoe 1692.—His son, JOHN, 1673–1747, Earl 1707, was an officer under Marlborough 1703–11, Ambassador to Paris 1715–20, Field-marshal 1741, and victor at Dettingen 1743.

Stake Driver. See BITTERN.

Stalactite. Icicle-like incrustations, often fretting the roofs of caverns and fissures; formed by the dropping and



Stalactites and Stalagmites.

evaporation of water containing lime, iron, etc., in solution. Stalagmites are similarly formed on the floors of caverns.

Staley, CADY, LL.D., b.1840. Prof. Union Coll. 1867; pres. Case School of Applied Science at Cleveland, Ohio, 1884. *Separate System of Sewerage*, 1886.

Stalker, JAMES, D.D., b.1848. Pastor in Glasgow. *Life of Jesus*, 1879; *St. Paul*, 1884; *Imago Christi*, 1889.

Stall. Fixed seat, inclosed more or less at back and sides.

Stallbaum, JOHANN GOTTFRIED, 1793–1861. Prof. Leipzig; ed. *Plato*, 1821–25, *Herodotus*, and other classics.

Stallo, JOHN BERNHARD, b.1823 in Germany. Judge in Cincinnati 1853–55; U. S. Minister to Italy 1885. *Philosophy of Nature*, 1848; *Modern Physics*, 1882.

Stalwarts. Section of the Republican party headed by Roscoe Conkling 1881 and opposed to Pres. Garfield.

Stamboul. Wealthiest, most populous and important division of Constantinople.

Stambuloff, NICHOLAS STEFAN, 1853–1895. Bulgarian statesman; pres. Sobranje 1884–86; regent, with two others, 1886–87; Premier 1887–94; dismissed by Ferdinand, whom he had placed on the throne; assassinated.

Stamens. Spore-bearing organs of flowers, usually consisting of a stalk (filament) bearing a double sac (anther) which contains the pollen-grains (microspores).

Stamford. City of Fairfield co., Conn., on Long Island Sound, 33 m. n.e. of New York; settled 1641, chartered 1830 and 1893. Its manufactures are varied. Pop., 1890, 15,700.

Stamford Bridge. In Yorkshire, on the Derwent. Here Harold defeated the invading Northmen Sept. 1066; their king and Earl Tostig were slain.

Staminate. Flowers in which the stamens are present without pistils.

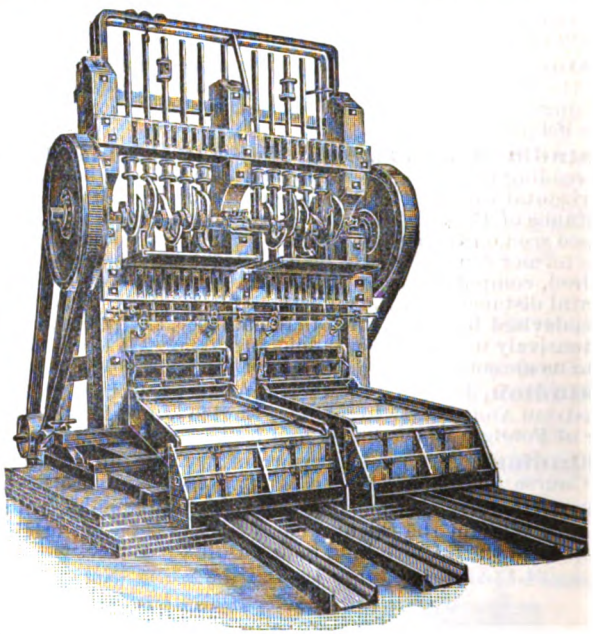
Staminodium. Vestigial stamen bearing no anther, usually occupying a position in the flower normally belonging to a perfect stamen.

Staminody. Change of other organs of a flower into stamens.

Stammering. Speech defect depending upon the want of harmonious action between the various sets of muscles concerned in speech, where in the effort to form words there is a more or less plainly marked spasmodic action interfering with their utterance. If there is a difficulty in producing a vocal sound, it is known as stuttering. Careful training of the muscles to act together will cure most cases of stammering.

Stamp Act. One of the measures of Parliament which led to the outbreak of revolution in the American colonies; passed March 1765 under the direct influence of George III. and as part of his repressive policy. It provided that no legal instrument should be valid in the colonies unless it bore the government stamp. Upon its promulgation in America bells were tolled, flags raised to half-mast, and newspapers put in mourning. It was repealed March 1766.

Stamp-Mill. 1. Machinery devised and constructed for breaking and crushing ores by the fall of heavy bodies upon them. The falling body (stamp) consists ordinarily of a stem provided with tappets, by which it is raised after each drop, and with a heavy iron or steel shoe at its lower end. In the steam stamps, of which there are several different types in use, the stem is connected with a piston, and is raised by the direct action of steam upon the piston. The ore to be crushed lies



Stamp-Mill.

on a hard and firm die or block, which may or may not be inclosed in a trough or mortar. In some mills the crushing is a dry process, in others a flow of water is employed to carry away the products of crushing as fast as formed. 2. Building with the machinery and apparatus needed, not only for crushing ore, but for the further mechanical treatment of the crushed product on jigging machines, vanners, slime-tables, buddles, etc.

Stamps. See PHILATELY.

Stamp Tax. Collected in the form of sale of stamps or stamped paper, the use of which is legally necessary to make certain documents valid. In U. S. they are required on tobacco, cigars, snuff, spirits, malt liquors, playing cards, and during the Civil War on many other articles.

Stanbery, HENRY, 1803–1881. Cincinnati lawyer; U. S. Atty.-gen. 1866; counsel of Pres. Johnson when under impeachment 1868.

Stanbridge, JOHN, ab.1450–ab.1524. Teacher at Oxford; writer of sundry pioneer text-books.

Stanchion. Stake or post used for a support.

Standard. See UNITS.

Standard (IN BOTANY). See VEXILLUM.

Standard, BATTLE OF THE. At Northallerton, Yorkshire, Aug. 22, 1138; so called from 3 banners of patron saints ranged about a tall cross mounted on a car which formed the English

center. The Scottish army under King David was defeated with loss of 11,000 men.

Standard-Bred. See HORSE.

Standard Candle. See CANDLE-POWER.

Standard Gauge. See BROAD GAUGE.

Standard of Deferred Payments. Money as fulfilling the function of measuring the value which will be ultimately received in settlement of a credit given.

Standard of Morality. Universally valid basis of ultimate decision of the rightfulness or wrongfulness of actions; such as general happiness, or moral intuition.

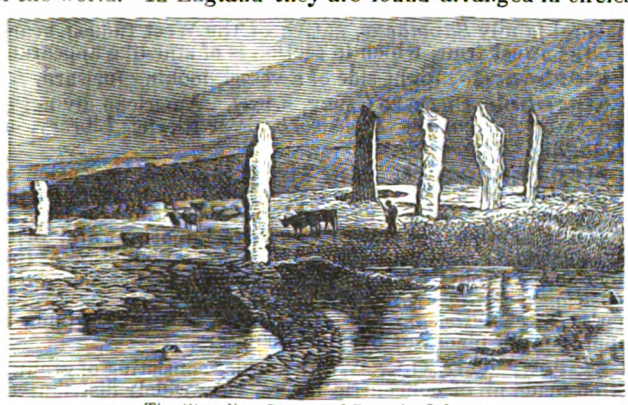
Standard of Value. See MEASURE OF VALUE.

Standards, MONETARY. There are three standards possible in the world; namely, gold or silver alone, and gold and silver together, the two former being MONOMETALLISM (q.v.) and the latter BIMETALLISM (q.v.). The tendency at present is toward a gold standard, though there are many persons who believe bimetallism possible. The demonetization of silver by several countries and large production of silver has lowered the relative value of that metal to $\frac{1}{36}$ that of gold. See SILVER STANDARD COUNTRIES and MONEY.

Standard Time. In N. America railroads employ five different standard meridians: Colonial, Eastern, Central, Mountain, and Pacific, the time differing 4, 5, 6, 7 and 8 hours from that of Greenwich; the minutes and seconds being the same everywhere. The Colonial meridian passes near Louisburg, N. S.; the Eastern, Phila.; the Central, St. Louis; the Mountain, Denver; the Pacific meridian is part of the boundary between Nevada and Cal.

Standing Army. Permanent peace establishment: in the U. S., that which has been fixed by legal enactment and for which Congress makes yearly appropriation. See U. S. ARMY and ARMED STRENGTH OF PRINCIPAL EUROPEAN COUNTRIES.

Standing Stones. Prehistoric monuments, consisting of tall stones, hewn or unhewn, are common in almost all parts of the world. In England they are found arranged in circles,



The Standing Stones of Stennis, Orkney.

as at Stonehenge, and are frequently called Druidical in mis take. Everywhere they are attributed to some past race, and without the pale of historic tradition.

Standish, MILES, 1584–1656. Associate of the pilgrims who came to America 1620 in the *Mayflower*, and their military leader in wars with the Indians; celebrated by Longfellow.

Stand Pipe. Large vertical pipe into which water is pumped and which transmits the head or pressure to the water in the street mains. It does not usually serve as a reservoir for storage, on account of its small size. See WATER TOWER.

Stanfield, WILLIAM CLARKSON, 1794–1867. English marine and military painter, R.A. 1835.

Stanford, CHARLES VILLIERS, b. 1852 in Dublin. Prof. Cambridge 1887, and now also Prof. of Composition and Orchestral Playing at Royal College of Music. He has composed operas, *The Veiled Prophet of Khorassan*, 1881, *Savonarola*, 1884, *Canterbury Pilgrims*, 1884, and *Shamus O'Brien*, 1896, besides symphonies and chamber music.

Stanford, LELAND, 1824–1893. Gov. of Cal. 1861–63; pres. Central Pacific R. R., completed 1869; U. S. Senator 1885–91; founder LELAND STANFORD JR. UNIV. (q.v.) 1887.

Stanhope, JAMES, 1ST EARL, 1675–1721. Major-gen. 1707; British commander in Spain 1708; victorious in Minorca and at Saragossa 1708–10; Sec. of State 1714 and 1718; Chancellor of the Exchequer and Viscount 1717, Earl 1718.—His grandson, CHARLES, 1753–1816, M.P. 1780, Earl 1786, was an extreme liberal and invented a printing-press.—His daughter, LADY HESTER LUCY, 1776–1839, noted for vigor and eccentricity, lived in Syria from 1810, and was revered by the Arabs as a chief and prophetess. *Memoirs*, 1845; *Travels*, 1846.—Her nephew, PHILIP HENRY, VISCOUNT MAHON, D.C.L., 1805–1875, M.P. 1830, Cabinet Minister 1834–35 and 1845–46, became Earl 1855. *War of Succession in Spain*, 1832; *Hist. England 1713–83*, 7 vols., 1836–54; *Life of Pitt*, 4 vols., 1861–62.—His son, EDWARD, b.1840, M.P. 1874, was Colonial Sec. 1886, and Sec. for War 1887.

Stanhope, PHILIP DORMER. See CHESTERFIELD.

Stanislas (LESZCYNSKI), 1677–1766. King of Poland 1705–9 and 1733–34; Duke of Lorraine 1735; resident mainly in France; patron of art and letters. *Works*, 1767.

Stanislaus, ST., 1030–1079. Bp. of Cracow; murdered, while at mass, by the King's order; canonized 1254; patron of Poland.

Stanley, ARTHUR PENRHYN, D.D., LL.D., 1815–1881. Prof. Oxford 1856–63; Dean of Westminster 1863; champion of liberal thought, and defender of Colenso; author of a few fine hymns. *Life of T. Arnold*, 1844; *Apostolic Age*, 1847; *Sinai and Palestine*, 1856; *Hist. Eastern Ch.*, 1861; *Hist. Jewish Ch.*, 1863–79; *Ch. of Scotland*, 1872; *Christian Institutions*, 1881.

Stanley, DAVID SLOAN, U.S.A., b.1828. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862–66, serving in the West; prominent under Sherman and Thomas; Brig.-gen. U.S.A. 1884.

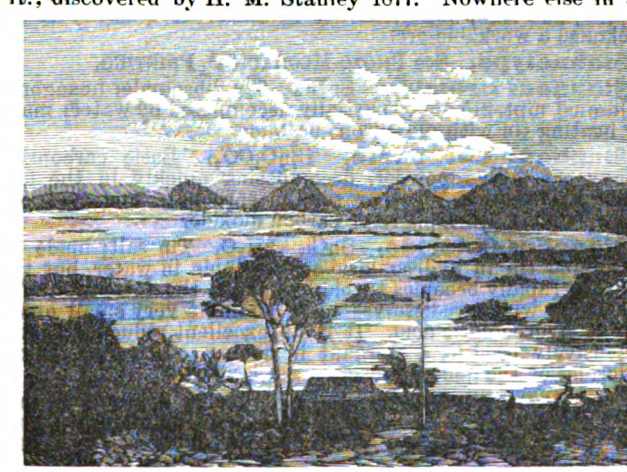
Stanley, EDWARD JOHN, BARON, 1802–1869. M.P. 1831, Peer 1848; member of several cabinets.

Stanley, FREDERICK ARTHUR, BARON, b.1841. M.P. 1865, Sec. for War 1878–80, Colonial Sec. 1885–86; Baron 1886; Gov.-gen. of Canada 1888–93; Earl of Derby 1893.

Stanley, HENRY MORTON, D.C.L., b.1841 in Wales. War correspondent of New York *Herald* 1868; sent to Africa 1871 to search for Dr. Livingstone, whom he found at Lake Tanganyika. On his second expedition, 1874–77, he explored the Nyanza lakes and the Congo. He founded the Congo Free State 1879–84, and in 1887 led an expedition to relieve Emin Bey, whom he brought to the e. coast 1889. His journeys and discoveries are recorded in: *How I found Livingstone*, 1872; *Coomassie and Magdala*, 1874; *Through the Dark Continent*, 1878; *The Congo*, 1885; *In Darkest Africa*, 1890. Other works are *My Kalulu*, 1873; *My Dark Companions*, 1893; *Slavery and the Slave-Trade*, 1893.

Stanley, THOMAS, 1625–1678. English translator of Æschylus 1663–64. *Hist. Philosophy*, 4 vols., 1655–62.

Stanley Pool. Expansion of the Congo just above the rapids, lat. 4° S.; ab. 80 sq. m. in extent, with a depth of 200 ft.; discovered by H. M. Stanley 1877. Nowhere else in the



Stanley Pool—View taken from Brazzaville.

whole Congo basin have more rapid changes been effected than at this point, where converge above the cataracts all the navigable waterways as far as the neighborhood of Tanganyika.

Stanly, FABIUS, U.S.N., 1815–1882. Commander 1861; on the Pacific 1862–64, on S. C. coast 1864–65; Captain 1866, Commodore 1870, Rear-admiral 1874.—His brother, EDWARD, ab. 1811–1872, was M.C. 1837–43 and 1849–53; military Gov. of N. C. 1862.

Stannard, GEORGE JERRISON, 1820–1886. Brig.-gen. U. S. Vols. 1863–66; active at Gettysburg and in Va.

Stannard, MRS. HENRIETTA ELIZA VAUGHAN (PALMER), ("JOHN STRANGE WINTER"), b.1856, m. Arthur 1884. English novelist. *Bootles' Baby*, 1885; *The Soul of the Bishop*, 1894.

Stannaries. Tin mines, especially those of Cornwall and Devon, which have charters, privileges, and courts, dating from 1201.

Stannates. Salts of stannic acid.

Stannic Acid. H_2SnO_3. Formed by boiling stannic chloride with water; soluble in the ordinary acids and in caustic alkalies. With the latter it forms stannates; *e.g.*, K_2SnO_3.

Stannic Bromide. $SnBr_4$. White crystalline mass, or large, transparent, colorless crystals; mpt. 30° C., bpt. 201° C.; soluble in water; made by heating tin in bromine vapor.

Stannic Chloride. $SnCl_4$. *Spiritus fumans Libavii.* Discovered 1605 by Libavius; strongly fuming liquid, bpt. 114° C.; made by treating tin with chlorine. It combines with water to form a number of crystallized hydrates. With other chlorides it forms double salts, the chlorstannates; *e.g.*, $SnCl_4,2NH_4Cl$. It is used as a mordant in dyeing.

Stannic Fluoride. $SnFl_4$. Found in solution obtained by treating tin dioxide with hydrofluoric acid.

Stannic Hydroxide. $Sn(OH)_4$. Formed perhaps when stannic chloride is boiled with water; if formed, it readily loses water, becoming stannic acid.

Stannic Iodide. SnI_4. Red crystalline mass. From a solution in carbon disulphide it crystallizes in octahedra. Mpt. 146° C. It is made by heating tin and iodine in closed tubes.

Stannic Nitrate. $Sn(NO_3)_4$?. Silky, lustrous scales, made by dissolving stannic hydroxide in nitric acid. The solution decomposes at 50° C.

Stannic Oxide. SnO_2. Found in nature as CASSITERITE (q.v.) or tinstone; obtained as a white powder by burning tin in the air; infusible, insoluble in nitric and hydrochloric acids: concentrated sulphuric acid converts it into a gelatinous liquid.

Stannic Phosphate. $2SnO_2.P_2O_5+10H_2O$. Formed by treating the dioxide with excess of phosphoric acid; insoluble in nitric acid.

Stannic Selenide. $SnSe_2$. Dark, reddish-brown powder; stable compound, soluble in aqua regia; made by precipitating a solution of stannic chloride with hydrogen selenide.

Stannic Sulphate. $Sn(SO_4)_2+2H_2O$. Small needles or rhombohedra, soluble in dilute sulphuric acid; made by precipitating stannic hydroxide from the chloride and dissolving in sulphuric acid.

Stannic Sulphide. SnS_2. Golden-yellow compound; the crystalline variety is known as Mosaic gold. It is made by heating tin filings with sulphur and ammonium chloride, and precipitated from stannic solutions by hydrogen sulphide. Mosaic gold is used as a pigment, especially for bronzing.

Stannite. Rare mineral compound of sulphur with tin, copper, and iron, not occurring in sufficient quantity to be reckoned a workable ore.

Stannotype. See PHOTO-MECHANICAL PRINTING.

Stannous Bromide. $SnBr_2$. Tin dibromide; hexagonal columns; mpt. 215.5° C.; partially decomposed by water; made by heating tin with mercurous bromide.

Stannous Carbonate. $2SnO.CO_2$. Basic carbonate; heavy crystalline powder, decomposing quickly in the air; made by bringing together sodium carbonate and stannous chloride in an atmosphere of carbon dioxide.

Stannous Chloride. $SnCl_2+2H_2O$. Tin salt; made by dissolving tin in hydrochloric acid; soluble in water, but the solution rapidly becomes turbid, owing to the formation of a basic salt, which redissolves upon adding a very small quantity of hydrochloric acid. It is an excellent reducing agent; extensively used as a mordant in dyeing. It forms double chlorides of the general formula $SnCl_2.2MCl$.

Stannous Fluoride. $SnFl_2$. Opaque columns or thin rhombohedral tablets, changing to the oxyfluoride on standing in the air; made by dissolving tin monoxide in hydrofluoric acid.

Stannous Hydroxide. $Sn(OH)_2$. Not known. A compound of the formula $Sn(OH)_2.SnO$ is obtained by treating stannous chloride with potassium carbonate. It readily loses water, forming a black powder, stannous oxide.

Stannous Iodide. SnI_2. Tin diiodide. Beautiful, lustrous, reddish-yellow prisms; made by treating tin with hydriodic acid.

Stannous Nitrate. $Sn(NO_3)_2$. Known only in solution; made by the action of very dilute nitric acid on tin. It rapidly becomes turbid on exposure to the air.

Stannous Oxide. SnO. Olive-colored or black powder; made by boiling stannous chloride with caustic soda. When heated in the air it takes fire, forming stannic oxide.

Stannous Phosphite. $SnHPO_3$. White precipitate, obtained on adding ammonium acid phosphite to a stannous chloride solution. It blackens on heating, with evolution of phosphine.

Stannous Selenide. SnSe. Bright gray, metallic, crystalline leaflets, melting at a red heat, giving a green vapor; obtained by fusing tin and selenium.

Stannous Sulphate. $SnSO_4$. Formed by dissolving tin or the hydroxide in dilute sulphuric acid. The solution is unstable.

Stannous Sulphide. SnS. Dark, bluish-gray, melting at a red heat; obtained by passing hydrogen sulphide into a stannous salt solution.

Stanovoi Mts. Range of e. Siberia, continuing the line of elevation of central Asia n.e. toward Bering Strait.

Stansbury, HOWARD, U.S.A., 1806–1863. Civil and military engineer, surveyor of lakes and rivers; explorer in Utah 1849–51.

Stanton, EDWIN MCMASTERS, 1814–1869. U. S. Atty.-gen. Dec. 1860; Sec. of War 1861–68; involved in difficulties with Pres. Johnson, who vainly attempted to remove him; Justice U. S. Supreme Court 1869. During the Civil War he was vigorous, aggressive, and tenacious, earning much fame and provoking the bitter enmity of many.

Stanton, ELIZABETH (CADY), b.1815, m.1840. American reformer, champion of woman's rights and suffrage since 1848.—Her husband, HENRY BREWSTER, 1805–1887, journalist, was active against slavery.—Their son, THEODORE, b.1851, is a correspondent in Paris. *Woman Question in Europe*, 1884.

Stanwix, JOHN, ab.1690–1765. British general, in America 1756–60; builder of Fort Stanwix, on the Mohawk, 1758; repairer of Fort Duquesne, Pittsburg, 1759.

Stanyhurst, RICHARD, ab.1545–1618. English R. C. theological and historical writer, chiefly in Latin; long in Flanders.

Staphylococcus. Solitary micrococcus or mass of solitary micrococci; also, generically, certain Bacteria.

Staples, WILLIAM READ, LL.D., 1798–1868. Judge R. I. Supreme Court 1835–54; Chief-justice 1854–56; historical writer.

Stapleton, THOMAS, 1535–1599. English R.C. divine, prof. at Douay and Louvain; author of much Latin polemic theology.

Star. See STARS, STAR CATALOGUES, and STAR GAUGES.

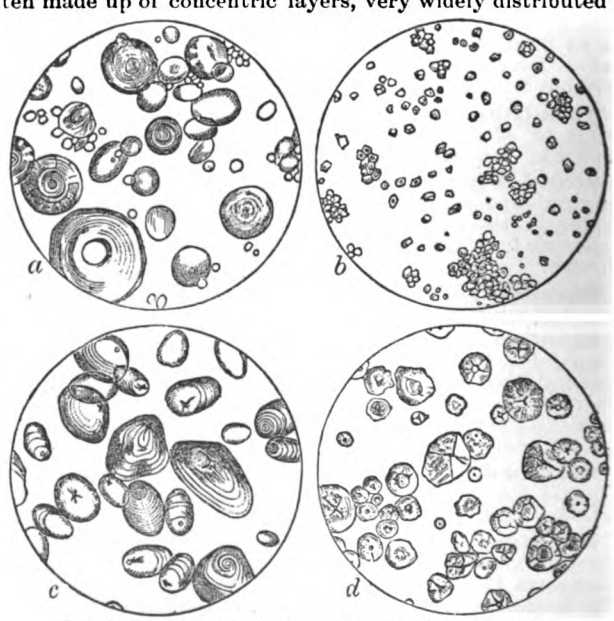
Star-Apple. *Chrysophyllum cainito.* Large tree of the natural family *Sapotaceæ*, native of the West Indies; bearing a large sweet fruit, which in section is of star-like appearance.

Starboard. Right side of a vessel, looking forward.

Starbuck, CHARLES CASEY, b.1827. American divine; collaborator on *Lange's Bible-work*, Post-Nicene Library, and *Johnson's Cyclopedia.*

Star Catalogues. Lists giving the right ascension and declination of a greater or less number of stars, with their magnitudes, and data for reducing their co-ordinates from one epoch to another. A few of the more important are: British Association Catalogue, 8,377 stars; Anwers' Reduction of Bradley's observations; *Piazzi precipuarium Stellarum Inerrantium positiones Mediæ;* Greenwich Catalogues, 8 or 10; Argelander's *Durchmusterung* of the Northern Heavens, giving the approximate places of over 324,000 stars.

Starch. $(C_6H_{10}O_5)_x$. White powder consisting of granules, often made up of concentric layers, very widely distributed in



Starch Granules: *a*, wheat; *b*, rice; *c*, potato; *d*, maize.

the vegetable world; insoluble in cold water, changed to starch paste by hot water. Acids and ferments readily cause the ad-

dition of water, thus forming a sugar. It is prepared commercially from the grains, rice, the sago palm, and various tubers such as potatoes. It is a carbohydrate, the commonest and most abundant of the solid contents of plant cells. It occurs in the form of rounded grains, which are developed from the protoplasmic granules called Leucoplastids. Wheat granules are $\frac{1}{1000}$ in. diameter and those of rice are $\frac{1}{3000}$ in. See NITROGEN FREE EXTRACT.

Star Chamber. Court of the Privy Council, established under Henry VII. It became oppressive, and was abolished 1640.

Starch Sugar. See GLUCOSES and DEXTROSE.

Star Clusters. Aggregations of stars having all degrees of condensation, from such examples as the Pleiades to those where a powerful telescope is required to show the individual stars; probably in most cases physically connected.

Star Cucumber. *Sicyos angulatus.* High-climbing vine of the natural family *Cucurbitaceæ*, native of N. America.

Stare Decisis. Policy of standing by decisions and not disturbing matters once judicially settled.

Starfishes. See ASTEROIDEA.

Star-Flower. See CHICKWEED WINTERGREEN.

Star Gauges. Method adopted by Herschel for determining the distribution of the stars. It consisted in counting the number of stars visible in certain definite small areas in different parts of the heavens. Assuming the stars to be distributed with some approach to uniformity in space, he hoped in this way to determine the general form of the stellar universe. The fundamental assumption is not now considered tenable.

Stargrass. Low yellow-flowered herbs of the genus *Hypoxys*, natural family *Amaryllidaceæ*, natives of N. America. See also COLIC ROOT.

Stargrass, WATER. *Heteranthera dubia.* Yellow-flowered aquatic herb of the natural family *Pontederiaceæ*, native of N. America.

Stark, JOHN, 1728–1822. Officer in the French war 1755–59; Col. of N. H. forces 1775–77; victor at Bennington, Vt., Aug. 16, 1777; Brig.-gen. 1777–83.

Starkie, THOMAS, 1782–1849. London judge. *Law of Slander*, 1812; *Criminal Pleading*, 1814; *Law of Evidence*, 1824.

Starkweather, JOHN CONVERSE, b.1830. Brig.-gen. U. S. Vols. 1863–65, serving chiefly in Tenn.

Starlings (STURNIDÆ). Old World Passerine birds, related to the New World Orioles (*Icteridæ*), but having 10 primaries.

Huia (*Creadion acutirostris*).

They are absent from Australia; but in New Zealand is the Huia Bird, the male of which has a long sharp straight beak, the female one still longer, which curves down, forming an arc of a circle nearly. The Sardinian Starling is uniformly black: the common European Starling is marked with white spots, each like the point of a flame. They otherwise resemble the American Blackbird. They destroy many insects, and nest in boxes put up for them. *Pastor* of S. Africa feeds on the insects that molest cattle.

Starnina, GHERARDO, 1354–ab.1407. Florentine painter.

Star of Bethlehem. A popular notion exists that the star which appeared at the birth of Christ is a periodic star appearing at intervals of ab. 300 years. There is no scientific basis for the notion.

Star-of-Bethlehem. *Ornithogalum umbellatum.* White-flowered herb of the Lily family, native of Europe, introduced as a weed into N. America.

Star of India, ORDER OF. Founded 1861, for the British possessions in India.

Staroverski, or PHILIPPINS. Branch of the RASKOLNIKS (q.v.), settled in e. Prussia and Luthania since 1700.

Starr, MOSES ALLEN, M.D., b.1854. Prof. in New York since 1886. *Nervous Diseases*, 1890; *Brain Surgery*, 1893.

Stars, NUMBER OF. Number of stars of 1st magnitude, 20; 2d, 34; 3d, 141; 4th, 327; 5th, 959; 6th, 4,424; total visible to the naked eye, 5,905. With a large telescope many millions are visible.

Stars and Stripes. See FLAG, AMERICAN.

Starstone. Variety of sapphire, which reflects the light perpendicular to the axis in form of a star, when cut in a hemispherical form.

Star-Thistle. *Centaurea calcitrapa.* Purple-flowered, spiny herb of the Composite family, native of Europe, introduced as a weed into N. America.

Starvation. Death from want of food and drink takes place in 5 to 8 days. With abundance of water alone a person may live 3 weeks. With desiccated food without water life can be prolonged a few days only. Starvation may be due to diseased condition of some of the digestive organs. Starving persons should be fed with great caution.

Starwort. See CHICKWEED and ASTER.

Starwort, WATER. Small, aquatic herbs of the genus *Callitriche*, natural family *Callitrichaceæ*, of wide geographical distribution.

Stas, JEAN SERVAIS, 1813–1891. Prof. of Chemistry at Brussels. He determined the atomic weights of many elements.

Stassfurt. Town of Prussia, 19 m. s.w. of Magdeburg, on the Bode. It owes its importance to deposits of potash salts and below these rock salt, the latter having a thickness of 750 ft.; first mined in 1839, but the production was greatly increased by borings 1851. In 1895 there was produced here 204,050 tons of potassium salts and 68,271 tons of rock salt. Pop. ab.20,000.

State. Society looked upon not as a mere assemblage of units, but as a collective person, declaring and enforcing laws, and acting in many ways as a moral agent; organized political community possessing sovereign powers; in the U. S., usually one of the members of the Union in contradistinction to the nation.

State Department. Portion of the Executive branch of the U. S. Government having charge of relations with foreign powers. Its functions in the various States must be sought in the State constitutions and statutes.

Staten Island. At entrance to New York Harbor, and adjoining N. J. Area 58 sq. m.; pop., 1890, 51,693.

Stater. Chief coin of the Greek standard, first struck in gold by Crœsus; found in gold, electrum, and silver. The weight varied in different standards, but the gold coin is

Macedonian Stater—British Museum.

the real stater; the Attic contained ab.132.5 grains of gold. Under Alexander it was worth nearly $6, and passed for 20 drachmæ.

State Religion. One established, endowed and maintained by the government of a nation. England and Scotland have a modified state religion which is Episcopalian. France subsidizes every communion of 100,000 adherents. Belgium aids Roman Catholics, Protestants and Jews. Italy is tolerant, but Roman Catholic is the state church; Spain and Portugal have the same, with little toleration. Turkey is Mohammedan. In Holland Protestants, Roman Catholics and Jews are subsidized. Austria-Hungary is tolerant, recognizing Roman Catholics, Greeks, Protestants, Armenians and Jews. Greece is tolerant, but the state church is Greek; Russia is also Greek, with no toleration. Denmark has full toleration, the state religion is Lutheranism, as in Norway and Sweden. Switzerland has absolute freedom of faith, as have the U. S.

State Religion of China. This has retained its main features during the past 3,000 years. The primary idea is that the emperor is the son of heaven, co-ordinate of heaven and earth. He cannot devolve on any other his function as high priest to offer oblations on the altars of heaven and earth at Peking. The members of the imperial clan and Board of Rites assist the emperor. No priests or women are admitted. The three regular annual services are at the winter solstice, the beginning of spring, and the summer solstice.

State Rights. Those possessed by the several States under the U. S. Constitution; their exact nature and extent are still a subject of controversy, though the civil war has negatived the right of a State to secede.

State's Evidence. That given by a criminal against his accomplices, on the understanding that he shall not be prosecuted.

States-General. Legislative assemblies of France before 1789; also those of the Netherlands.

State Socialism. Intervention of government in fields of industry which might be left to private enterprise; *e.g.*, state ownership of railroads, telegraphs, gas and waterworks, and loans for agricultural improvements.

States of the Church. See PAPAL STATES.

State Weather Service. Organization designed to determine by observation the local climates and meteorological phenomena of the respective States. Early attempts were made by Mass., N. Y., and Pa., but all had fallen into decay when, in 1881, Gen. Hazen by circular invited all States to organize such services in co-operation with the Signal Office. Thirty States are now covered by such organization: their observations are summarized in the *Monthly Weather Review* of the Signal Service.

Statical Baroscope. Apparatus adopted by Boyle 1666 to show the changes in density of the air. It consists of a thin large glass globe hanging counterpoised by a small glass weight: when the barometric column rises the glass globe also rises by its buoyancy.

Static Charge. When any body has been electrified and the electricity is in equilibrium, the body is said to have acquired an electrostatic charge. The charge of a condenser is of this sort. Deep sea cables and even long telegraph lines have a certain electrostatic capacity; on this account it takes an appreciable time to produce a signal at the far end, since the cable must be charged and discharged in the act.

Statics. Branch of dynamics which treats of forces in equilibrium. The statics of fluids is hydrostatics. The fundamental problem of statics considers the conditions which forces must fulfill in order that they may be in equilibrium when applied to a material particle or to a rigid body.

Statigraphy. Study of the strata in the order in which they occur.

Station. In Botany, locality where a plant was collected.

Stationary Wave. If a wave motion be propagated in an elastic medium, as a tube filled with air, and meet an obstacle in such position that it is reflected directly back on its path, the direct wave and the reflected wave will interfere in opposite phases at intervals of half a wave length, starting from the reflecting surface. The resultant motion is a stationary wave. The same phenomenon may be observed in the transverse vibrations of a stretched string.

Station Error IN LATITUDE DETERMINATION. Difference between the Geographical and Astronomical latitude, due to local deviations of the plumb line. There is a similar error in longitude. The deviation is usually small, but in extreme cases has been found to amount to 30 or 40 seconds of arc.

Stationers' Hall. Building in London, belonging to the Company of Stationers, incorporated 1557; here the registration of copyright began in 1554. This was compulsory until the passing of the Copyright Act in 1842, and all printers had to serve an apprenticeship to a member of the Company. The registration is advantageous in copyright claims.

Stations of the Cross. Pictures or other representations of the stages (usually 14) of the Passion, from Pilate's sentence to the interment; found in R. C. churches around or above the altar, and sometimes in roads and public places; places for special devotion since ab.1550.

Statistics. Branch of Political Science which collects and arranges the facts relating to the condition of a people, including population, industries, society, politics and morals. Upon this political economy and beneficial legislation depend. Censuses for military purposes and for taxation were made in ancient times. In the latter part of the 18th century the science was much broadened by Conring, Achenwall, and Süssmilch in Germany, and, in the present century, by Quetelet of Belgium. In the U. S. much is done in this direction by the national, state, and municipal governments.

Statius, C. See CÆCILIUS STATIUS.

Statius, PUBLIUS PAPINIUS, ab.43–ab.96. Latin poet. Author of the *Thebaid*, 12 books, *Silvæ*, 5 books, and *Achilleis*, 2 books, all extant. He has been ranked next after Virgil as an epic poet.

Statoblast. Hard-shelled, unfertilized egg, which appears in fresh water *Polyzoa* in autumn, rests during winter, and develops the following summer.

Status. Legal standing of a natural or artificial person; of more importance in Roman than in English law.

Statute Merchant and Statute Staple. Securities for debts, entered into pursuant to ancient English statutes, which gave to the creditor an estate in the debtor's lands until the debt was paid.

Statutes. Written legislative enactments; in Gt. Britain, supreme law of the land; in U. S., invalid if in conflict with constitutional provisions.

Staudlin, KARL FRIEDRICH, 1761–1826. Prof. Göttingen from 1790; writer on Ch. history and ethics.

Staudt, KARL GEORG CHRISTIAN VON, 1798–1867. Prof. Erlangen. *Geometrie der Lagi*, 1847–60.

Staunton, SIR GEORGE LEONARD, 1737–1801. Sec. to Lord Macartney in India; historian of the embassy to China 1792; Baronet 1784.—His son, SIR GEORGE THOMAS, 1781–1859, M.P. 1818–52, wrote much on China.

Staunton, HOWARD, 1810–1874. English writer on chess; editor of Shakespeare, 1858–60.

Staunton, WILLIAM, D.D., 1803–1889. American divine. *Ecclesiastical Dictionary*, 1844–61.

Staupitz, JOHANN VON, D.D., d.1524. Vicar-gen. of the Augustinians in Germany 1503–20; prior of a convent at Wittenberg, and first dean of the Univ. 1502; patron and friend of Luther, whose appointment as prof. he secured 1508. His works were collected 1867.

Stauraxonia. In Promorphology, animals having axes and cross axes; so named by Haeckel. There are two groups, *Homopola* and *Heteropola*.

Staurolite. Mineral of uncertain composition, containing aluminium, magnesium, iron, and silica, crystallizing in peculiar cross-shaped forms, and occurring as an accessory ingredient in some of the metamorphic schists.

Stauromedusæ (CALYCOZOA). Order of acraspedote Jellyfishes, having four wide perradial stomach pouches and four horseshoe-shaped reproductive glands in the wall of the umbrella. There are no sensory tentacles, *e.g.*, *Lucernaria*.

Stavanger. Town of s.w. Norway, 100 m. s. of Bergen. It has a gothic cathedral built in the 11th century. It exports large quantities of fish, sheep and minerals. Much visited by tourists.

Stavenhagen, BERNHARD, b.1862. German pianist and composer. He appeared in Berlin 1890, and in New York Dec. 1894.

Stay and Stay-bolt. A stay in a boiler is a tie-rod to hold together two flat surfaces (or areas of flat curvature) and to prevent deformation of such parts by internal pressure. The simplest stay is a round bar flattened at the ends and riveted through the flattened parts to the two surfaces. Better than this is to have the stay end in an eye, which is pinned to a socket on the plate. The socket may be double, or the eye double and the socket single. The pins should be in double shear. The socket is often a piece of T-iron, or two pieces of

angle iron. Gusset-stays are pieces of plate riveted in a radial plane to head and shell of a boiler to prevent bulging of the head. For staying distant surfaces to each other, the rods are often flat links like bridge eye-bars; to get them in conveniently they are short and several are pinned together. For staying crown-sheet bars to the dome of locomotives, the palm stay is used, a round bar flattened to an area to receive four rivets, which fits the cylindrical surface of the dome. For water-legs, or parallel surfaces exposed to pressure tending to separate them, stay-bolts are used. These are rivets of length sufficient to have the plates at desired distance, headed over on the outside of each. Such stay-bolts are either ordinary rivets, or rivets with a distance piece between the plates, to keep them parallel and prevent the buckling which occurs when it is not used with stays put in hot. The distance piece is usually a split tube, to allow water to cool the bolt. Cold stay-bolts are screwed into their holes and then headed over. Hollow bolts are also used, screwed and headed, and have the advantage of letting air into the fire-box, and revealing at once by leakage when corrosion has proceeded to a danger limit. Such stay-bolts are calculated for a strain of 6,000 lbs. per sq. in., and spaced at a distance between centers not so large as to exceed this strain at the calculated pressure.

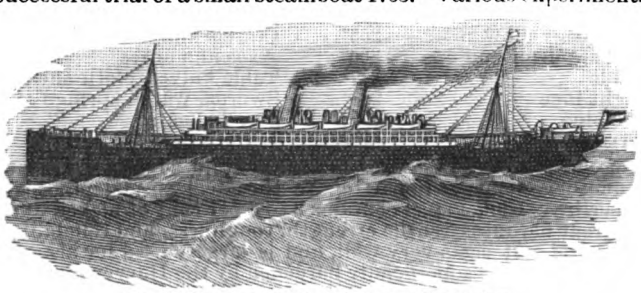
Stay-Bar. Horizontal iron bar between the jambs of a window.

Stays, NAUTICAL. Large ropes from the masthead, brought down in front of the masts to prevent them from springing.

Stead, WILLIAM THOMAS, b.1849. English journalist and reformer; ed. *Pall Mall Gazette* 1880–89, and *Review of Reviews* since 1890. *Truth about Russia*, 1888; *If Christ Came to Chicago*, 1894.

Steam. Transparent and invisible vapor of water, having approximately, when superheated, the physical properties of a gas, the volume of which is inversely proportionate to the pressure. As used in an engine it is saturated steam, and the volume increases less rapidly. A cu. in. of water at the pressure of the atmosphere is converted into 1,645 cu. in. of steam. To raise a pound of water from 0° C. to 100° there are required 180 heat units, and to evaporate it at that temperature, 966.6 units in addition, this last heat being latent. The amount of heat for higher temperatures and pressures increases but slightly. See GAS, HEAT, LATENT HEAT, SATURATED STEAM, and SUPERHEATED STEAM.

Steamboats. In 1707 Papin used a steam engine to propel a model vessel on the Fulda at Cassel. Wm. Henry of Pa. made successful trial of a small steamboat 1763. Various experiments



North German Lloyd Twin-screw Steamship.

were made in France, England and U. S. from 1774, till Robert Fulton made his trip in the *Clermont* from New York to Albany, April 7–9, 1807. First steamboat in Gt. Britain was used 1812: the first to cross the Atlantic was the *Savannah*, of 300 tons, 1819; the voyage from Savannah to Liverpool occupied 25 days.

Steam Boiler. See BOILER.

Steam Engine. The steam-engines of the U. S. represent 7,500,000 horse-power, England 7,000,000, Germany 4,500,000, France 3,000,000, Austria 1,500,000; in addition there are 105,000 locomotives of 3,000,000 horse-power; a total of 26,500,000 horse-power, equal to 1,000,000,000 men. See ENGINE.

Steam Heating. Method of warming apartments by distributing heat to them from a fire external to them, using steam as a vehicle. The advantages of steam as such are, first, its rapid flow by differences of pressure; second, that its condensation on the radiating surfaces causes immense reduction of its volume and a rapid rush of fresh steam to the vacant space, without extraneous circulating devices, so that a much less volume has to be returned to the boiler if condensation is complete. Steam heating is done either by direct radiators (see RADIATORS) in the rooms to be warmed, where the hot metal heats both by radiation to objects and by contact with the air in the room, or by indirect radiators, where the metal surface is not in the room to be warmed and acts by contact only upon air, which is distributed by flues as required. The first method is much the more efficient and economical, but is objected to by many as giving a very dry heat. It is the only practicable method for large and high buildings with a multitude of rooms and of temperaments in the occupants, who may each control his temperature by valves on his radiator: the objection, moreover, is hardly valid with abundant supply of fresh air to the rooms. The second method by indirect radiation compels each flue to furnish fresh air, and is more applicable to buildings with few large volumes to be heated, such as private houses and institutions. Shops and mills are admirably heated by direct radiation from pipes overhead. Exhaust steam from engines can also be profitably used with pipes of larger area in the heating coils. Usual steam pressures are from 5 to 15 lbs. Condensed water is returned to the boiler by a TRAP (q.v.). By such systems of distributing heat the labor of heating a large building is concentrated, and thereby lessened. Fuel does not have to be carried up nor refuse carried down, and the starting and cleansing of room fires is avoided, while the fire risk in office buildings and hotels is much less.

Steam Jacket. Device to keep up the temperature of the walls of an engine cylinder by circulating steam from the boiler within an outer casing surrounding them. The casting of the cylinder is either made with double walls, and the heads cast hollow similarly (the first a matter of some difficulty, owing to unequal contraction in cooling, whereby the inner wall is put under strain and is likely to crack or break), or else the cylinder bore is inserted within the larger cylinder of the jacket, a steam-tight fit being secured at the ends. The water condensed from the jacket returns to the boiler. The object sought in the steam jacket is to diminish the amount of internal condensation and re-evaporation by supplying heat from outside to replace what is radiated to the moist vapor inside during expansion and the exhaust stroke. Experiments have shown that the steam jackets on a steam engine caused an economy of 11¾ per cent on a single-cylinder engine, but were without appreciable effect in causing economy on the small cylinder of a compound engine working at its most economical degree of expansion. On the large cylinder of a compound engine, the economy of the steam jacket is about the same as on a single engine cylinder.

Steam Vessels. See SHIPBUILDING.

Stearic Acid. $C_{18}H_{36}O_2$. White solid, insoluble in water, crystallizing in plates; mpt. 69° C. Combined with glycerin as stearin, it forms a main constituent of animal and some vegetable fats. Combined as a sodium salt, it is the main constituent of ordinary soap. It can be obtained by decomposing its soap with a mineral acid, or by the decomposition of fats by acids or water. The ordinary stearin candles consist of an impure stearic acid.

Stearins. GLYCERIDES (q.v.) of STEARIC ACID (q.v.). The common stearin or tri-stearin is a main constituent of animal fats. It is a white solid, softening at 55° C.

Stearns, WILLIAM AUGUSTUS, D.D., 1805–1876. Pres. Amherst Coll. from 1854.—His nephew, LEWIS FRENCH, D.D., 1847–1892, was prof. at Bangor, Me., from 1880. *Evidence of Experience*, 1891; *Present-day Theology*, 1893.

Steatite. Granular soapstone. See TALC.

Stebbins, HORATIO, D.D., b.1821. Unitarian pastor at San Francisco since 1864.

Steckel, LOUIS JOSEPH RENÉ, b.1844 in Alsace. Civil engineer in Canada.

Stedman, EDMUND CLARENCE, LL.D., b.1833. American poet and critic. *Alice of Monmouth*, 1864; *The Blameless Prince*, 1869; *Victorian Poets*, 1875; *Poets of America*, 1885; *Nature and Elements of Poetry*, 1892. He has edited a *Library of American Literature*, 11 vols., 1888–90; *A Victorian Anthology*, 1895, and Poe's Works, 10 vols., 1895–96.

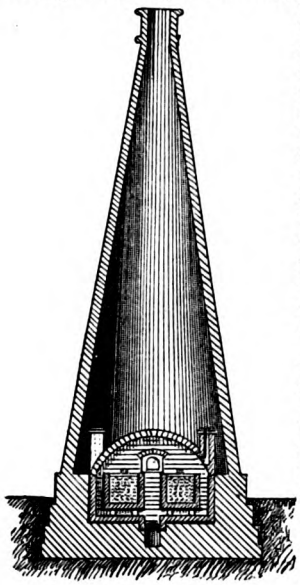
Steedman, CHARLES, U.S.N., 1811–1890. Captain 1862; active on the Atlantic coast; Commodore 1866, Rear-admiral 1871.

Steedman, JAMES BARRETT, 1818–1883. Brig.-gen. U. S. Vols. 1862, Major-gen. 1864–66; distinguished at Chattanooga and Nashville.

Steel, METALLURGY OF. Steel was formerly defined as iron containing sufficient carbon to harden by sudden cooling from a high temperature, and not enough to prevent its being forged. It now includes all this, and, in addition, any other malleable form of iron which has been perfectly fused in the process of its manufacture; *i.e.*, all commercial forms of malleable iron excepting wrought-iron and malleable castings made by decarburizing cast-iron castings. Castings made by melting

down pig-iron and steel-scrap in a cupola are properly called steel, but are usually of very inferior quality. Malleable metal which has been fused but does not contain enough carbon to harden is called mild or soft steel; with less than 0.1 per cent of carbon it is dead-soft steel. The hardest steel contains 1.5 per cent of carbon; in general, over 0.4 per cent causes a steel to harden perceptibly; all containing over 1 per cent of carbon are called high-carbon steels. Steel for knives and tools contains 1 per cent; razors 1.5 per cent.

Blister or Cement Steel.—Made from the softest and purest wrought-iron by imbedding it in fine charcoal and keeping it there some time at a yellow heat. The carbon penetrates the metal at the rate of ab. one-eighth in. every 24 hrs. The process is called cementation, and is carried on in large furnaces containing many tons of wrought-iron bars packed in charcoal in large iron cases, tightly closed. The ancient process of imbedding soft iron in a fire was essentially the same process carried out on an open hearth. On opening the iron boxes, the steel bars are broken and graded by the appearance of their fractured surfaces.

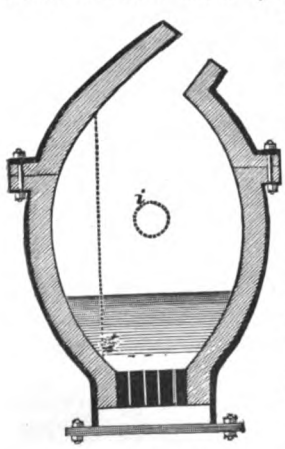


Cementation Furnace.

Cast-Steel.—Originally that made by melting bars of blister or cement steel in crucibles, thus producing a perfectly uniform, homogeneous metal, which is cast into ingots and these hammered, rolled, or worked into any desired shape. The process was first introduced in Sheffield ab.1750, and made its steel renowned as the best made. An inferior quality of similar cast-steel is made by melting the same material on the hearth of a large furnace instead of in crucibles, but the product has not the quality of the finest crucible cast-steel.

Puddled Steel.—Made in the puddling furnace by arresting the process when part of the carbon has been removed from the pig-iron and enough left in to produce a malleable metal which will yet harden. The quality of the product is very uncertain, and its manufacture is rapidly falling out of commercial use.

Bessemer Steel.—Made by the invention of Sir Henry Bessemer, consisting in placing melted pig-iron in a pear-shaped vessel (converter) and blowing air rapidly through it. The air oxidizes the silicon, carbon, manganese, and some iron, the heat set free in this oxidation keeping the bath perfectly fluid even when it consists only of pure iron. After this stage is attained, the metal has sufficient carbon restored to it to form steel of any desired quality by introducing the proper quantity of spiegeleisen (an alloy of iron containing 8 to 15 per cent of manganese and 5 to 6 of carbon) or of ferromanganese (a similar alloy with 40 to 80 per cent of manganese). The manganese is necessary in order to remove any oxygen left in the metal from the blowing; the latter alloy is used when making low-carbon steels, as its use permits of the introduction of the necessary amount of manganese without at the same time adding much carbon. The converter used is lined with refractory material and mounted on trunnions, so that, on being rotated, the melted metal cannot run into the blast nozzles in the bottom lining when the air is shut off. Ordinary Bessemer steel is not the finest quality of steel. It usually has a tensile strength of 50,000 to 60,000 lbs., and an elongation before rupture of 15 to 25 per cent. Its principal use is for railroad rails and roof trusses. See BESSEMER and CONVERTER.



Bessemer Converter.

Basic Bessemer Steel.—When the lining of the converter is (as Bessemer used it) of silica bricks or siliceous matter, it is necessary to use pig-iron very low in phosphorus and sulphur, since these ingredients are not eliminated and injure the quality of the product, phosphorus making it brittle when cold, and sulphur brittle when hot. Thomas and Gilchrist lined their converter with basic material, such as burned magnesian limestone, and by adding lime to the bath were enabled to remove phosphorus and sulphur in the very basic slag formed. This process has largely supplanted the original one, particularly in Germany, as it permits using the cheaper grades of pig-iron for making the best of steel. The highly phosphoric slag is used as a fertilizer. This steel is largely used for bridge work and constructions in general.

Siemens-Martin Steel.—Frequently called acid open-hearth steel; made by melting pig-iron on the hearth of a regenerative gas furnace, and either oxidizing it down to steel, or diluting it down with pure iron. To oxidize the carbon out of the pig-iron, air may be admitted to pass over it, or a blast of air may be blown upon it, or, finally, iron oxide ore may be put into the bath, which is reduced to iron by the carbon in the pig-iron, thus removing the carbon and increasing the amount of iron present. The oxidation of the carbon may be arrested when it has reached the desired point, or, as is more usual, the bath is totally decarburized and then recarburized by spiegeleisen or ferromanganese, as in the Bessemer process. The advantages of this method of working over the Bessemer are that the reactions are much slower, and thus allow the end condition to be reached more exactly; moreover, if the quality is not just right, the metal can be kept melted in the furnace, and any necessary additions made to it, until it is perfectly right. The uniformity in quality of the metal produced is a great advantage, and is especially useful when making very soft steel, where slight variations in composition make great changes in the physical properties. See SIEMENS.

Basic Open-hearth Steel.—Made in the same kind of furnace as the former, excepting that the hearth is lined with basic material, such as roasted magnesite and bauxite. The production of a basic slag by throwing in lime permits the use of charges containing much phosphorus and sulphur, and the complete elimination of these harmful ingredients in the slag. This steel is very reliable, and is used for boiler sheets and in all places where great uniformity and reliability are needed, and particularly for the low-carbon steels.

Tempering Steel.—Process of first hardening the metal by chilling it from a red heat, and then softening it to any required degree by heating to a certain temperature. A low temperature draws out part of the hardness; a dull red draws out almost all. After heating to the temper heat, the metal may be cooled either slowly or quickly. The temper heat is generally noted by the color-film on the heated steel, but the temperature is a more accurate guide.

Color of Film.	Temperature.	Suitable for Tempering.
Faint yellow	220° C.	Lancets
Faint straw	230°	Razors
Full yellow	243°	Penknives
Brownish-yellow	255°	Chisels and metal shears
Brown, purple spots	265°	Axes and adzes
Purple	277°	Table knives, cloth shears
Bright blue	288°	Swords, watch springs
Fine blue	293°	Small shears
Dark blue	316°	Large saws

Special Steels.—These are such as contain several per cent of another element, imparting to the steel special physical properties. Nickel steel contains 3 to 6 per cent of nickel, and has great hardness, tensile strength, toughness, and reliability in general. It casts very well, and is largely used for armor-plates, which are superficially hardened by the Harvey method of cementation. Krupp hardens these plates by gas. Manganese steel contains 8 to 14 per cent of manganese, and possesses the unusual combination of extreme hardness and toughness, such as commend its use for rolls, jaws of squeezers, stamp heads, and material to stand the heaviest wear. Chrome steel, with 1 to 3 per cent of chromium, is intensely hard but somewhat brittle. It is principally used for tools intended for cutting or chiseling. Steel, containing tungsten, is used for tools. Many other special steels have been described, but none have come into such general use as the above.

Steel Production in 1896, in Metric Tons.

	U. S.	*Gt. Brit.*	*Germany.*	*France.*	*Aust.-Hung'y.*	*Sweden, 1895.*
Bessemer ingots	3,919,906	1,357,580	351,500	726,848	120,103	79,470
Basic Bessemer		458,262	3,004,600		223,758	17,824
Acid open-hearth	522,444	2,145,268	184,100	401,921	21,057	76,541
Basic open-hearth	776,256	172,287	1,293,700		524,973	19,634
Crucible steel	60,689	105,000		11,161		
Puddled steel				12,864		
Other kinds	2,394		65,300	7,176		
Total	5,281,689	4,238,397	4,899,200	1,159,970	889,891	193,469
Steel rails, included in Bessemer ingots	1,102,892	817,476		170,675		

Belgium produced 598,755 tons of steel billets; Spain, 104,577

tons; Italy, 157,899 tons; Russia 625,000 tons of steel. The production of the world is estimated at 17,581,131 tons.

Steel, STRENGTH OF. Average values are 100,000 lbs. per sq. in. in tension and 150,000 in compression; but the material is subject to great variations in strength, depending upon its chemical composition and the process of manufacture. Structural steel is usually from 60,000 to 70,000 lbs. per sq. in. in tensile strength.

Steel, MRS. FLORA ANNIE (WEBSTER), b.1847, m.1867. Scottish novelist, in India 1867–90. *Miss Stuart's Legacy*, 1893; *Tales of the Punjab*, 1894; *Red Rowans*, 1896; *On the Face of the Waters*, 1896; *In the Tideway*, 1897.

Steele, ANNE, 1716–1778. English hymnist. *Poems by Theodosia*, 1760. Many of her lyrics were long in extensive use.

Steele, FREDERICK, U.S.A., 1819–1868. Major-gen. U.S. Vols. 1862–67; distinguished in the West, especially in Arkansas.

Steele, JOEL DORMAN, 1836–1886. American author of scientific and historical textbooks.

Steele, SIR RICHARD, 1672–1729. Irish author, who first gave the periodical essay its prominence in literature by the

Sir Richard Steele.

Tatler, 1709–11; associated with Addison on the *Spectator*, 1711–12, and the *Guardian*, 1712; M.P. 1712, knighted 1715.

Steel Engraving. The steel plate, after being cleaned with Putz-pomade, is warmed and coated with white wax or an etching ground, to which the design is transferred by tracing or gelatin paper; through this ground the design is elaborated with the needle. The plate is now placed in the nitric acid bath and the drawing bitten in, after which the ground is removed with turpentine. With the graver the workman now carefully enters the etched lines, the color value of which is obtained by their width and depth. The thin and shallow lines carry little ink, and, in printing, the paper, being forced into the lines, takes the ink from them and they appear faint and delicate. The broad and deep lines, carrying more ink, have force and strength. The tools are a square and a lozenge graver, a scraper and a burnisher to remove the ridges on either side of the line made by the gravers. The graver is of good steel, 3 to 4 in. long, set in a wooden or cork handle. The parallel lines for skies in cheaper work are traced through the etching ground by a steel or diamond point in a ruling machine, and are then etched by the acid bath. For high-class commercial work, as bank bills and bonds, the tangled line work and borders are done by the geometric lathe, which cuts them into a soft steel plate; this is then hardened, and a cylinder of soft steel is rolled over the plate with a pressure of 20 tons, which reproduces the lines in relief on the cylinder. The latter is then hardened and the design can be transferred and repeated by this into soft plates, producing uniformity in duplicating parts. The printing on paper is done by steam-press, the best work by hand. The plate is laid upon a stone or iron plate heated from below and the ink forced into all the lines by a soft roller. The ink is then removed by a cloth from the surface, which is then polished by the palm of the hand and whiting, no ink being removed from the lines. Damp paper is then laid upon it, two thick soft blankets above, and the paper forced into the lines of the plate by the rollers of the printing press, bringing out the ink. The lines are thus brought out clear upon an unstained white paper. Great skill is required to produce a first-class plate, and years of training. There is not much demand for the prints except from collectors, and steel engraving as an art is a thing of the past. Copper-plate engraving is accomplished in a similar manner. For the history of engraving see WOOD ENGRAVING. See also AQUATINT, MEZZOTINT, and STIPPLE ENGRAVING.

Steell, SIR JOHN, 1804–1891. Scottish sculptor.

Steelton. Borough of Dauphin co., Pa., on the Susquehanna, 3 m. s.e. of Harrisburg; founded 1866, chartered 1880. It has important steel works and other mills. Pop., 1890, 9,250.

Steelyard, or ROMAN BALANCE. See SCALE.

Steen, JAN, 1626–1679. Dutch genre painter, who affected low life subjects with a satiric turn. His execution is of won-

The Sick Girl, by Jan Steen (in Amsterdam).

derful finish. His best works are at The Hague and in Amsterdam. He was a pupil of Brouwer and Van Ostade; the influence of the latter is evident in his principal works.

Steendam, JACOB, b.1616. First (Dutch) poet of New York. *Complaint of New Amsterdam*, 1659; *Praise of New Netherland*, 1661.

Steen Kerken. Village of Hainault, Belgium; scene of a defeat of British troops under William III. by the French under Luxembourg, Aug. 3, 1692.

Steenstrup, JOHANNES IAPETUS SMITH, b.1813. Prof. Copenhagen 1845–85; writer on zoölogy.—His son, JOHANNES, b.1844, archæologist, pub. *Normannerne*, 1876–82.

Steenwyck, HENDRICK, ab.1550–1603. Dutch painter and decorator; as was his son, HENDRICK, 1580–ab.1649, in London from 1629.

Steeple. Tower of a church, including the spire or lantern upon it.

Steeplebush. See HARDHACK.

Steeplechase. Modification of the board game, played with dice; best known in Europe as the Game of Goose, in which the circuit represents the course on a race-track. It is of English origin, but is now a common child's game in France, Germany, and the U. S. Similar games are extremely popular in Japan.

Steeplechase. Race in which the contestants originally selected some easily observed point in the distance, as a church steeple, and made a direct run for that point; now one of practically well-confined limits. The first race was in Ireland, 1752.

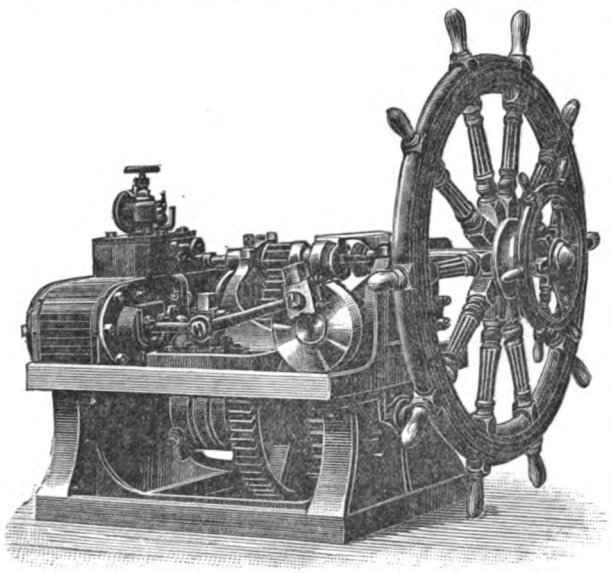
Steeple Engine. Compound engine in which the two pistons are attached on the same piston-rod, and the smaller

high-pressure cylinder stands on top of the larger low-pressure cylinder, in an inverted vertical engine. They have been much used in marine practice. See COMPOUND and TANDEM ENGINE.

Steeple-Jack. Person who repairs steeples and chimneys.

Steering. See STEERING-GEAR, STEAM.

Steering-Gear, STEAM. Machine for applying steam power to moving the rudders of large vessels. There are two general types. The first is an ordinary reversible hoisting engine of some approved type, on whose barrel are wound the tiller chains in opposite directions. This engine is placed below the pilot house, and its valve and reversing gear are controlled by wire ropes or a shaft from the barrel of a small hand-wheel which the steersman turns to port or starboard by similar motions as for hand-steering. The position of the tiller is



Combined Steam and Hand Bridge Steering-Gear.

indicated by a tell-tale, which moves as the former is pulled by the engine. The second type operates directly upon the rudder-post by links from nuts on right and left screws, so that the connection has fewer points for breakage than in the other type, but the mechanism is more bulky. The steam steering-gears enable one man easily to handle a boat which formerly needed four men in easy channels and currents, and more when rapid manipulation was required, as in tortuous channels with swift currents.

Steevens, GEORGE, 1736–1800. English editor of Shakespeare, 1773 and 1793.

Stefan, JOSEF, 1835–1893. Prof. Physics, Vienna, 1863.

Stefan's Law (OF RADIATION). The quantity of heat lost by radiation is proportional to the fourth power of the absolute temperature.

Steffens, HENRICH, 1773–1845. Norwegian-German theologian, novelist, geologist and mineralogist. Prof. Halle 1804, Breslau 1811, and Berlin 1831. *Handbuch der Oryktognosie*, 3 vols., 1811–19; *Anthropologie*, 1822; *Autobiography*, 1840–45, tr. 1863.

Stegani. 1. See STEGANOPODES. 2. Form of swimming foot of birds, characterized by having the hind toe included in a web with the three anterior toes.

Steganophthalma. See DISCOPHORA.

Steganopodes (DYSPOROMORPHÆ, STEGANI, TOTIPALMATÆ). Division of Natatores, including large swimming birds, with small head, well-developed wings, and four toes included in one web. Here belong the Pelicans, Frigate-birds, Tropic-birds, Cormorants, and Gannets (Solan-Geese), one species of which produces the true guano.

Stegocarpous. Sporanges in mosses which open by a terminal cap to emit the spores.

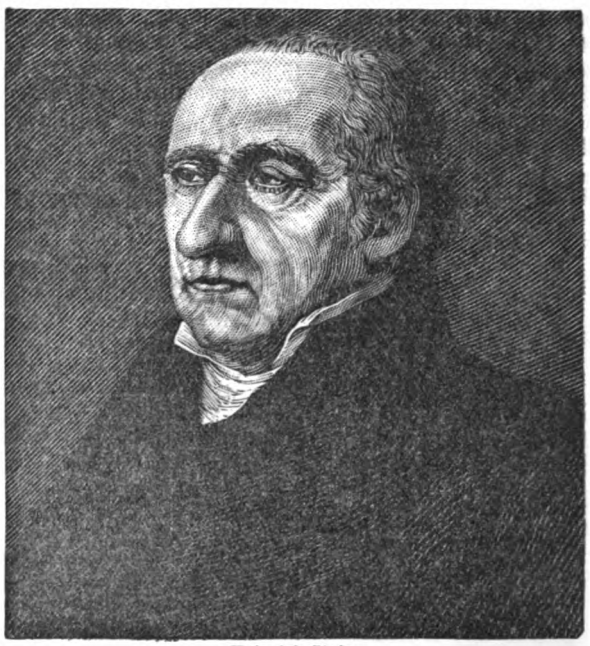
Stegocephali. Amphibians of the Coal and Permian (LABYRINTHODONTS (q.v.) and *Ganocephala*), on account of the bony plates protecting their heads; remarkable, generalized types, connecting together fishes, amphibians, and reptiles.

Stehedrin, MIKHAIL SALTIKOFF, 1826–1889. Russian story-writer and satirist.

Stein, CHARLOTTE VON, 1742–1827. Friend and correspondent of Goethe, whose letters to her were pub. 1848–51 and 1883–86.

Stein, CONRAD, 1701–1762. Prof. Breslau; writer on American history.

Stein, HEINRICH FRIEDRICH KARL, FREIHERR VON, 1757–1831. German statesman and patriot, in the Prussian civil service from 1780; Foreign Minister 1807. He signed the famous edict of emancipation, labored with Scharnhorst for reorganization of the army, and effected other fundamental reforms, preparing Prussia for the final struggle with Napoleon, who procured his dismissal and outlawed him 1808.



Heinrich Stein.

He became the unofficial adviser of Alexander I. of Russia 1812; with Yorck, aroused Prussia to arm against Napoleon, and brought about the treaty of Kalisch between Russia and Prussia. After the battle of Leipzig, 1813, he was pres. of the Central Commission appointed to administer the territory occupied by the allied armies. His later life was spent in retirement. In 1819 he founded the society for publishing *Monumenta Germaniæ Historica*.

Stein, HEINZ VON. Leader of the peasants' insurrection in Thurgau, Switzerland, 992.

Steinbel, ROGER NELSON, U.S.N., b.1810. Active in the West 1861–62; Captain 1866, Commodore 1870, Rear-admiral 1874.

Steinen, KARL VON, b. 1855. German explorer in Brazil 1884–85 and 1887–88.

Steiner, JACOB, 1796–1863. Prof. Berlin 1834; called "the greatest geometrician since the time of Apollonius." *Works*, 2 vols., 1881–82.

Steinheil, LOUIS CHARLES AUGUSTE, 1814–1885. French painter.

Steinitz, WILLIAM, b.1836 at Prague. Chess-player, long in England; in the U. S. from 1883.

Steinmetz, KARL FRIEDRICH VON, 1796–1877. Prussian general, distinguished in the war with Austria 1866; less successful in France; Gov.-gen. of Posen and Silesia Sept. 1870; Field-marshal 1871.

Steinschneider, MORITZ, b.1816. Teacher in Berlin from 1845; Hebrew bibliographer. *Jewish Literature*, tr. 1857; *Uebusetzungen des Mittelalters*, 1893.

Steinthal, HEYMANN, b.1823. Prof. of Comparative Philology at Berlin 1863. His investigations in the science of language have greatly advanced knowledge. *Ethik*, 1885.

Steinway, HENRY ENGELHARD, 1797–1871. German pianoforte maker, in New York from 1850; founder of a noted firm. —His son, WILLIAM, 1836–1896, succeeded him as its head.

Steinwehr, ADOLF WILLIAM AUGUST FREDERICK, FREIHERR VON, 1822–1877. Brig.-gen. U. S. Vols. 1861–65, serving chiefly in Va.; author of geographical text-books. *Gazetteer*, 1873.

Stellate. Plant-hairs of a radiating structure; also other organs or organisms resembling a star.

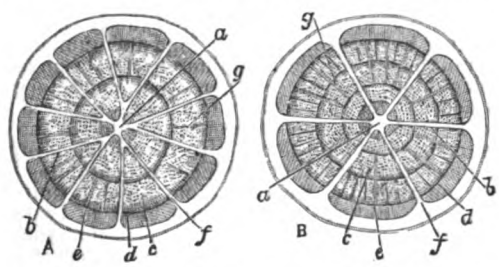
Stellerida. See ASTEROIDEA.

Stelmatopoda. See GYMNOLÆMATA.

Stelvio Pass. From Bormio to Meran in the Adige valley, n. Italy; famous for the highest carriage road in Europe, 9,046 ft. above sea, finished 1825.

Stelzner, ALFRED WILHELM, 1840–1895. Prof. of Geology at Freiberg 1871–74 and Cordova; writer on the phenomena of ore-deposits, and the geology and paleontology of Argentina.

Stem. Ascending axis of plants. It is composed of fibrous, spiral and cellular tissues, arranged in different ways; typically it assumes a cylindrical form and perpendicular position, bearing the remaining aerial parts of the plant. Sometimes it is so weak as to be procumbent, and in some plants the stem is so short as to seem to be wanting. Subterranean stems, as the tuber and rhizome, have been mistaken for roots.



Diagrammatic cross-sections of a young Dicotyledonous Stem:

A, a two-year old stem; B, a three-year old stem: *a*, pith; *b*, primary medullary rays; *c*, wood, in two layers in A, in three layers in B; *d*, cambium ring; *e*, bast; *f*, cambium (interfascicular) between the bundles; *g*, secondary medullary rays.

Stem. Piece of timber into which the sides of a vessel are united at the fore end.

Stemmata. Simple eyes. See OCELLI.

Stenciling. Printing by a metallic plate, out of which letters or patterns are cut, and transferred by brush to a wall or other surface on which the plate is laid.

Stendhal. See BEYLE, H.

Steneosauria. See CROCODILIA.

Stennett, SAMUEL, 1633–1713. English Baptist, whose *Hymns for the Lord's Supper*, 1697–1700, preceded the appearance of Dr. Watts.—His grandson, SAMUEL, D.D., 1727–1795, is better known as a hymnist.

Stennis. See STANDING STONES.

Steno, NICHOLAS, 1638–1687. Danish physician, anatomist and geologist, in Florence 1667–77; vicar-apostolic to n. Germany 1677.

Stenography. See SHORTHAND.

Stenopetalous. Flowers with narrow petals.

Stenosis. In Plant Physiology, cell-division, accompanied by the narrowing of the mother-cell around the plane of partition.

Stenostomata. See CTENOPHORA.

Stentor. One of the *Heterotricha;* trumpet-shaped, with a circle of long cilia around its broad end. Its nucleus is moniliform. It has a superficial resemblance to *Vorticella*, but is entirely covered by cilia.

Stentor. Greek herald in the Trojan war, noted for his loud voice.

Step-Gear. Gear wheels of same pitch diameter and number of teeth, set side by side on the same shaft, so that, starting from one side, a tooth on one wheel was set just a little in advance of the same tooth of the preceding wheel, and each tooth was thus made of a series of steps. Such wheels, separate and fastened together, or with the same effect secured in one casting, give the strength due to large pitch and thickness of tooth, and the smoothness due to large numbers of teeth, since the bottom step of a tooth is still in gear with its mate, when the next tooth is well under way. When the steps become infinitely small, the broken line is a curve, and HELICAL GEAR (q.v.) results.

Stephanite. $5Ag_2S+Sb_2S_3$. Rich ore of silver combined with sulphur and antimony; also known as brittle silver ore. It has been found in considerable quantity in the Saxon and Bohemian mines and in Nevada.

Stephanome. Instrument invented at Ben Nevis observatory for measuring the angular diameter of halos, fogbows, and glories.

Stephanus. Byzantine author of uncertain date. Of his geographical dictionary, *Ethnika*, we have an outline by Hermolaus.

Stephen, ST. d. ab.37. Hellenistic Jew, early Christian disciple, chosen one of the Seven Apostolic Assistants, or Deacons; stoned by the Jews, and thus the protomartyr of the Gospel. His day is Dec. 26.

Stephen, ST., 977–1038. First King of Hungary from 1,000; active as a missionary; crowned 1,000, canonized 1687. The national order of knighthood, instituted 1764 by Maria Theresa, is named from him.

Stephen I. Bp. of Rome 254–257. He opposed the rebaptism of heretics, is said to have been martyred, and was canonized.—II. Pope 752 for two days.—III. Pope 752–757. He crowned Pepin the Little, who in return drove out the Lombards and gave him the exarchate of Ravenna, with which the States of the Ch. began.—IV. 768–772.—V. 816–817.—VI. 885–891.—VII. 896–897.—VIII. 929–931.—IX. 939–942.—X. 1057–58.

Stephen, 1105–1154. King of England 1135; son of S., Count of Blois, and Adela, daughter of William the Conqueror. He disputed the succession with Matilda, daughter of Henry I.; her son Henry succeeded him.

Stephen, ADAM, ab.1730–1791. Va. soldier, Brig.-gen. 1776, Major-gen. 1777; engaged at Trenton and Brandywine; dismissed for the mishap at Germantown.

Stephen, SIR GEORGE, b.1829. Pres. Canadian Pacific R. R. 1881–88; Baronet 1886.

Stephen, JAMES, 1759–1832. M.P. for Tralee; Master in Chancery; associate of Wilberforce. *Slavery of British W. Indies*, 1824–30.—His son, HENRY JOHN, 1787–1864, pub. *Treatise on Pleading*, 1824; *Summary of Criminal Law*, 1834; and *New Commentaries*, 1841–45. The latter was revised by his son, JAMES, LL.D., b.1820, prof. King's Coll., London.—Henry's brother, SIR JAMES, 1789–1859, Under-Sec. for the Colonies 1834–47, was knighted 1847, prof. Cambridge from 1849, and a historical writer.—His son, SIR JAMES FITZJAMES, 1829–1894, one of the Council of India 1869–72, Judge of Queen's Bench 1877–91, was knighted 1877 and made Baronet 1891. *Hist. Criminal Law*, 1863; Digests of the *Law of Evidence* and of Criminal Law, 1876–77; *Nuncomar*, 1885; *Horæ Sabbaticæ*, 1892.—His brother, LESLIE, b.1832, edited *Cornhill Mag.* 1871–82, and vols. 1–25 *Dict. National Biography*, 1885–91. *Playground of Europe*, 1871; *Hours in a Library*, 1874–79; Lives of Johnson, Pope, Swift, H. Fawcett, and Sir J. F. Stephen, 1878–95; *Science of Ethics*, 1882; *An Agnostic's Apology*, 1893; *Social Rights and Duties*, 1896.

Stephen Bathori. See BATHORY, S.

Stephens, ALEXANDER HAMILTON, LL.D., 1812–1883. M.C. from Ga. 1843–59 and 1873–82; opposed to secession 1860; Vice-pres. C.S.A. 1861–65; Gov. of Ga. 1883. *War between the States*, 1867–70; *Hist. U. S.*, 1870–83.

Stephens, ANN SOPHIA (WINTERBOTHAM). 1813–1886, m.1831. American novelist. *Fashion and Famine*, 1854; *Works*, 23 vols., 1886.

Stephens, GEORGE, 1813–1895. English prof. Univ. Copenhagen 1855–93. *Runic Monuments*, 1866–84.

Stephens, JAMES, b.1824. Irish conspirator, long in France and America; imprisoned 1864.

Stephens, JOHN LLOYD, 1805–1852. American traveler. *Egypt, Arabia*, etc., 1837; *Greece, Turkey, Russia*, 1838. More important were his books on *Central America* and *Yucatan*, 1841–43.

Stephens, WILLIAM, 1671–1753. Sec. of Ga. 1737; pres. of the colony 1743–50. *Journal*, 1742.

Stephenson, GEORGE, 1781–1848. Father of railways. He built a road-traction engine 1812, a railroad engine with steam-blast 1815, and brought out a miner's safety-lamp. He was engineer of the Stockton and Darlington R.R. 1823, and of the Liverpool and Manchester R.R. 1825. For 15 years he was actively engaged in railroad and locomotive building.—His son, ROBERT, 1803–1859, assisted him in railroad engineering, especially in locomotive building at the Newcastle works, where he built the "Rocket" for the competitive trial of locomotives at Rainhill, Oct. 6, 1829, and attained with it a speed of 29 m. per hour; he became engineer of the

London and Birmingham R.R., opened 1838, and is best known for his iron bridges for railroads; viz., Conway tubular bridge,

George Stephenson.

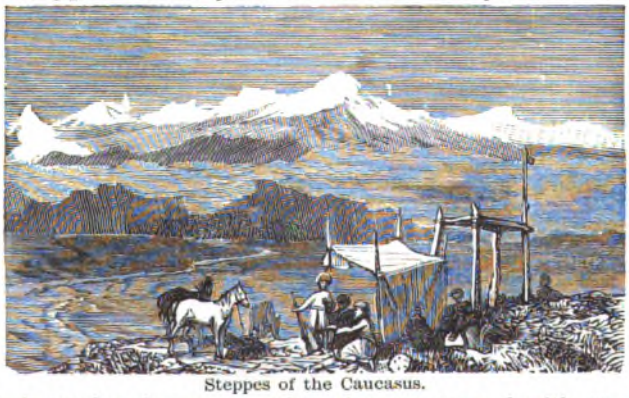
Victoria bridge over the St. Lawrence, Britannia tubular bridge over the Menai Straits, high viaducts at Newcastle and Berwick, and some bridges in Egypt. He was an M.P. from 1847.

Stephenson's Link-Motion. Valve motion purchased by George Stephenson from Wm. Howe, to apply to his locomotives, to secure easy reversal of motion and variation in point of cut-off. On the axle are two eccentrics, one set behind the crank on that side the right amount to drive the valve for forward motion, the other set the similar amount ahead of the crank, or behind for going the other way. The rods on these two eccentrics are pinned to the link proper, which is a curved bar slotted on an arc whose radius is the distance from center of shaft to center of link. The rod for forward motion drives the upper end of this link; the back rod drives the lower end. In the slot fits a block upon a pin on a hanging arm from a rock-shaft; an arm from that shaft, projecting upward, drives the valve rod, which passes into the steam chest. The vertical position of the sliding-block is fixed by the lower rocker arm, but the link can be raised and lowered by a lever in the cab working a bell-crank lever, from whose lateral arm the link is hung. When the forward rod is opposite the slider block, the valve distributes steam for forward motion; when the link is raised, the back-rod is opposite the slider, and the back-eccentric controls the valve. In intermediate positions on each side of the center, the valve-travel is diminished, and an earlier cut-off is effected. The difficulty urged against the theory of this link-motion is that the lifting of the links swings the rods around the eccentrics, and hence makes the lead vary for the different points of cut-off; but the practical advantages are considered in most cases to outweigh this difficulty. See LINK-MOTION.

Stepniak, SERGIUS MICHAEL DRAGOMANOFF (KARTSCHEFFSKY), 1841–1895. Russian liberal, exiled 1876, in London from 1885. *Underground Russia*, tr. 1883; *Russia Under the Tsars*, tr. 1885; *King Stork and King Log*, 1896.

Steppe-Murrain. CATTLE PLAGUE (q.v.).

Steppes. Great plains of Siberia. Except in the late



Steppes of the Caucasus.

spring and early summer, when they are covered with grass and flowers, they are semi-deserts. They correspond in appearances and relations to the llanos and pampas of S. America and the prairies of the U. S. See PLAIN.

Step Vein. Mineral vein in which the angle of dip has frequent alternations between high and low.

Stercorite. Natural hydrous sodium ammonium phosphate, found as a mineral in some guano deposits.

Sterculiaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 55 genera and ab. 900 species, widely distributed throughout the warmer regions of the whole globe.

Stere. Cubic meter, equal to 35.3156 cu. ft.

Stereid. Cell of the stereome in a fibro-vascular bundle.

Stereobate. Base of a wall.

Stereochemistry. Chemistry in space. Its fundamental conception is that every molecule is made up of atoms which occupy certain definite positions in space. Many compounds are known, two or more of which have exactly the same composition, being made up of the same kind and number of atoms. They differ in their properties, the difference in the physical properties being more pronounced than other characteristics. In order to account for this fact, it has been suggested by Van't Hoff and Le Bel that the differences are due to the different positions in space which the constituent atoms occupy. This is based upon the fact that compounds containing an asymmetric carbon atom, *i.e.*, a carbon atom which is united to four different groups (radicals) or elements, exist in two varieties. If it be imagined that a carbon atom is placed at the center of a tetrahedron holding in combination four different groups or elements, then from theoretical considerations it follows that there are two and only two possible arrangements of the groups or elements in space. If the tetrahedron idea be applied to those compounds containing the asymmetric carbon atom, a satisfactory explanation for the isomeric forms results.

Stereochrome. Fresco in which soluble glass is used as the medium between the paint and plastering. It is seen at its best at Munich, in the works of Kaulbach, Schnorr and Overbeck. See FRESCO.

Stereograph. Pair of pictures viewed by a stereoscope.

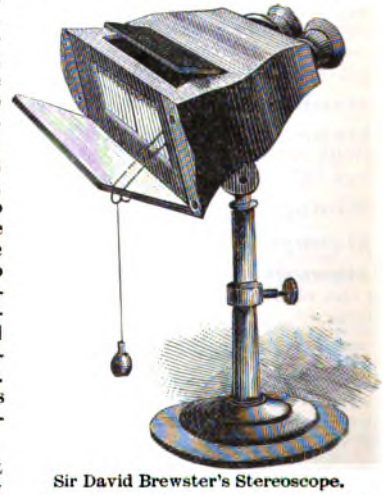
Stereome. In Plant Anatomy, elements of strength in a fibro-vascular bundle, as the wood-cells or liber-cells.

Stereometer. See VOLUMENOMETER.

Stereomonoscope. Modification of the stereoscope for producing the stereoscopic effect from a single picture.

Stereoplasma. In Plant Anatomy, solid portion of protoplasm.

Stereoscope. Optical instrument for giving to pictures the appearance of solid forms as seen in nature. In the earliest form, devised by Wheatstone, two plane reflectors are so placed in relation to two dissimilar perspective pictures of an object, one representing it as it appears to the right eye, the other as it appears to the left, as to superpose the virtual images, the combination appearing to be a solid body and a perfect counterpart of the object. A later form, called the lenticular stereoscope, devised by Sir D. Brewster, accomplishes the same result by refraction.



Sir David Brewster's Stereoscope.

Stereotyping. Art invented about 1725 by Wm. Ged of Edinburgh, who used a plaster mold of the forms for casting the type metal. In 1793 Wm. Carey, the missionary, devised a new method, using a matrix formed by letting a form of type fall on a surface of hot lead, a process improved by F. Didot of Paris. Curved plates for cylinder presses were patented in England 1815. By the papier-maché process plates can be made in six minutes, and several plates may be cast from the same matrix; a pad of damp tissue paper is impressed upon the forms, thus forming the mold.

Sterett, ANDREW, U.S.N., ab.1760–1807. Lieut. 1798; distinguished in the war with Tripoli 1801.—His cousin, ISAAC SEARS, U.S.N., 1801–1863, was active in the war with Mexico, and became captain 1857.

Sterigma. Short projection from the sporophore of a

fungus, bearing one or more spores; also similar projections from the prothallium of certain ferns, bearing gemmæ; and the supports of the leaves in spruces.

Sterility. Inability to produce offspring or seed: due to (1) absence of the sexual cells in the male, the female, or both; (2) structural differences in the sexual cells, or differences in their position, period of maturation, etc., preventing their conjugation, as in sterility between different species; (3) absence of mutual attraction between the sexual cells, as in some cases between members of same species (cases are known of childless married couples begetting children on both sides after divorce and remarriage); (4) presence of accidental conditions of nutrition, disease, etc.

Sterilization. Destruction of all the bacteria on or in a given body. This may be secured by heat, as a flame for non-combustible objects; steam for other objects; or by a chemical, as corrosive sublimate, a germicidal solution of carbolic acid, creolin, etc.; by insolation, or lastly by dessication (drying). In the canning of fruit, etc., it is sometimes needful to heat the substance over again the following day, as certain spores that resisted the first heating have had time to assume the vegetative stage. Usually three heatings of liquids to the boiling point for three successive days, each of 15 minutes' duration, is absolutely certain to sterilize the most refractory case. Milk can be sterilized at 150° F. by repeating the pasteurization daily for a week or so.

Sterilized Milk. See STERILIZATION.

Sterling, JOHN, 1806–1844. English essayist, novelist, and poet, of noble character and aims, greatly prized by Emerson and other select spirits; subject of memoirs by J. C. Hare, 1848, and Carlyle, 1851.

Stern, DANIEL. See AGOULT.

Sternberg, KASPAR, GRAF, 1761–1838. German botanist. *Revisio Saxifragarum iconibus illustrata*, 1810; *Pflanzenkunde in Böhmen*, 1818; *Flora der Vorwelt*, 1820–38.

Sternbergia. Sandstone casts of the pith of fossil trees, especially of the Carboniferous age.

Sterne, LAURENCE, 1713–1768. English humorist, prebendary of York 1739. *Tristram Shandy*, 1759–67; *Sermons*, 7 vols., 1760–69; *Sentimental Journey*, 1767; *Letters*, 1775. Though insincere, extravagant, and open to serious objection on grounds of taste and morals alike, his books show talent of an order allied to genius, and are still read.

Sterne, SIMON, b.1839. Lawyer and reformer in New York. *Personal Representation*, 1870; *Constitutional Hist. U. S.*, 1882.

Sterne, STUART. See BLOEDE, GERTRUDE.

Sternhold, THOMAS, ab.1500–1549. Groom of the Robes to Henry VIII., author of 40 renderings in the "Old Version" of the Psalms, ab.1547–62: 60 were by John Hopkins (d.1570), 26 by Thomas Norton, and 12 by Wm. Whittingham (d.1579).

Sternum, or BREASTBONE. Symmetrical bone to which the ribs are attached, situated at the fore part of the chest. See CLAVICLE and RIBS.

Sternutation. SNEEZING (q.v.).

Sterraster. Form of sponge spicule, present in the genus *Geodia*; spherical in form, with numerous short pointed rays, separate only at their apices.

Sterrett, JOHN ROBERT SITLINGTON, b.1851. Greek prof. at Amherst 1892; epigraphist. *Wolfe Expedition to Asia*, 1888.

Stesichorus, ab.635–ab.556 B.C. Sicilian Greek lyric poet, who wrote on epic subjects. Fragments only remain.

Stetefeldt, CARL AUGUST, b.1838. German-American mining engineer and metallurgist. Inventor of a roasting furnace.

Stethoscope. Instrument employed in physical diagnosis for mediate auscultation, invented by Laennec. It is an instrument whereby the sounds of the various organs of the body, more particularly the heart and the lungs, can be separated and listened to. It consists essentially of a perforated disk, to place over the part, connected by a tube to the ear-piece for the listener. The phonendoscope is a recent improvement wherein the sounds are intensified by the interposition of two metallic disks, so arranged as to be thrown in vibration and magnifying the original sound. See LAENNEC, R. T.

Stettin. Seaport of Old City of Pomerania, Prussia, on the Oder, near a gulf of the Baltic; one of the chief commercial centers of Prussia, with considerable manufactures: held by Sweden 1648–1720, and by France 1806–13. Pop., 1890, 116,139.

Steuart, SIR JAMES DENHAM, 1712–1780. Scottish Jacobite, in exile 1745–63. *Political Economy*, 1770.

Steuben, FREDERIC WILLIAM AUGUSTUS, BARON VON, 1730–1794. Prussian officer, in the American service; Major-gen. 1778. He proved of most efficient service in establishing a system of discipline and tactics, as well as in the field, especially in Va. After the war he lived in New York.

Steubenville. Capital of Jefferson co., O.; on the Ohio, 43 m. w. of Pittsburg; site of Fort Steuben, built 1787; settled 1798, chartered 1851; in a region rich in coal, gas, and oil. It has iron and other manufactures. Pop., 1890, 13,394.

Steudel, ERNST GOTTLIEB, 1783–1856. German botanist. *Enumeratio plantarum Germaniæ Helvetiæque indigenarum*, 1826; *Nomenclator botanicus*, 1840–41.

Stevens, ABEL, LL.D., 1815–1897. Ed. *Zion's Herald*, Boston, 1840–52, N. Y. *Christian Advocate*, 1856–60, and *Methodist*, 1865–74. *Hist. Methodism*, 3 vols., 1858–61; *Hist. M. E. Ch. U.S.A.*, 5 vols., 1864–96; *Mme. de Stael*, 1881.

Stevens, ALFRED, b.1828. Belgian-French painter of society scenes.

Stevens, ALFRED GEORGE, 1818–1875. English decorator and sculptor. His chief work is the monument of Wellington in St. Paul's Cathedral, begun 1856 and incomplete.

Stevens, CHARLES ELLIS, LL.D., D.C.L., b.1853. Rector in Phila. *Sources of the Constitution*, 1894.

Stevens, EBENEZER, 1751–1823. Officer in the war of independence.—His son, ALEXANDER HODGDON, M.D., LL.D., 1789–1869, was Prof. of Surgery in New York College of Physicians 1825–38, and pres. 1841–55. *Lithotomy*, 1838.—His nephew, JOHN AUSTIN, b.1827, pub. a life of Gallatin, 1883, and much on American history.

Stevens, EDWARD, 1745–1820. Col. 10th Va. 1776; Brig.-gen. 1777–82; distinguished in Pa., S. C., and Va.

Stevens, GEORGE BARKER, D.D., b.1854. Prof. Yale 1886. *Pauline and Johannine Theology*, 1892–94.

Stevens, HENRY, 1819–1886. American bibliographer, in London from 1845; prolific writer and compiler.

Stevens, ISAAC INGALLS, U.S.A., 1818–1862. Gov. of Washington Terr. 1853–57; surveyor for N. Pac. R.R.; M.C. 1857–61; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; killed near Chantilly, Va.

Stevens, JOHN, 1749–1838. Rival of Fulton in inventing steam vessels 1804 and later: promoter of steam navigation and of railways.—His son, ROBERT LIVINGSTON, 1787–1856, developed some of his plans, introduced tubular boilers and T-rails, and invented the balance valve (1831) for beam engines.—His brother, EDWIN AUGUSTUS, 1795–1868, was his associate in railroad and steamship work, and founded the STEVENS INSTITUTE (q.v.).

Stevens, JOHN LEAVITT, LL.D., 1820–1895. U. S. Minister to Uruguay 1873–76, to Sweden 1877–83, and to the Sandwich Islands 1889–93.

Stevens, THADDEUS, 1792–1868. M.C. from Pa. 1849–53 and from 1859; Republican leader. He proposed the impeachment of Pres. Johnson 1868, and was one of its managers.

Stevens, THOMAS HOLDUP, U.S.N., 1795–1841. Lieut. 1813; distinguished on Lake Erie, and against W. India pirates 1820; Captain 1836.—His son and namesake, 1819–1896, was engaged on the Atlantic and Gulf coasts 1861–65, became Captain 1866, Commodore 1872, and Rear-admiral 1879.

Stevens, WALTER HUSTED, 1827–1867. Brig.-gen. C.S.A. 1861; chief engineer under Gen. Lee.

Stevens, WALTER LE CONTE, b.1847. Prof. of Physics in Rensselaer Polytechnic Institute 1892.

Stevens, WILLIAM BACON, D.D., LL.D., 1815–1887. Bp. of Pa. 1865. *Hist. Ga.*, 1847; *Parables*, 1855.

Stevens Institute OF TECHNOLOGY. At Hoboken, N. J.; founded 1870. It has 23 in the faculty, ab. 266 students, and courses in mechanical and electrical engineering, chemistry and physics.

Stevenson, ADLAI EWING, b.1835. American statesman, M.C. 1875–77, 1879–81; Vice-President 1893–97.

Stevenson, ANDREW, 1784–1857. M.C. from Va. 1823–34, Speaker 1827–34; Minister to Gt. Britain 1836–41; rector Univ. Va. from 1841.—His son, JOHN WHITE, 1812–1886, was M.C. from Ky. 1857–61, Gov. 1867–71, U. S. Senator 1871–77, law prof. at Cincinnati 1877, and pres. American Bar Association 1884.

Stevenson, JAMES, 1840–1888. Ethnologist, connected with Western surveys under Hayden and Powell.

Stevenson, JOHN D., b.1821. Brig.-gen. U. S. Vols. 1862–67, serving chiefly in the Southwest; Col. U.S.A. 1866–71.

Stevenson, ROBERT, 1772–1850. Scottish engineer, inspector of lighthouses 1796–1843, builder of the Bell Rock and 22 others; inventor of intermittent and flashing lights.—His son and successor, ALAN, 1807–1865, did much similar work.

Stevenson, ROBERT LOUIS BALFOUR, 1850–1894. Scottish novelist and poet; grandson of Robert; eminent for wealth of imagination and purity of style. His chief works in fiction are: *New Arabian Nights*, 1882–90; *Treasure Island*, 1883; *Prince Otto*, 1885; *Dr. Jekyll and Mr. Hyde*, 1886; *Kidnapped*,

1886; *The Merry Men*, etc., 1887; *Master of Ballantrae*, 1889; *David Balfour*, 1893; *St. Ives*, 1897. Of essays, travels, etc., he wrote *An Inland Voyage*, 1877; *With a Donkey in the Cevennes*, 1879; *Virginibus Puerisque*, 1881; *Men and Books*, 1882; *Silverado Squatters*, 1884; *Memories and Portraits*, 1887; *Across the Plains*, etc., 1892; *Vailima Letters*, 1896; and in poetry, *A Child's Garden of Verse*, 1885; *Underwoods*, 1887, and *Ballads*, 1891. His last years were spent in Samoa. See OSBOURNE, LLOYD.

Stevenson, THOMAS GREELY, 1836–1864. Brig.-gen. U. S. Vols. 1862; active in N. C. and S. C.; killed at Spottsylvania.

Stevin, or **Stevinus,** SIMON, 1548–1620. Dutch mathematician and physicist. *Arithmetic*, 1585; *Statics and Hydrostatics*, 1586.

Stewards, HOSPITAL. Non-commissioned officers of the army belonging to the Hospital Corps; they make up prescriptions, administer medicines, and have general supervision of the sick and wounded under the direction of a medical officer.

Stewart (or STUART) **Dynasty.** Scottish sovereigns: Robert II., 1371.—III., 1390.—James I., 1424.—II., 1437.—III., 1460.—IV., 1488.—V., 1513. The female Stewart line was represented by Maria Theresa, wife of Prince Leopold of Bavaria, through Henrietta, daughter of Charles I. James VI. (1567), son of Mary Queen of Scots, was descended through his grandfather James V. from Margaret, elder sister of Henry VIII., lineal heir to the throne of England, when the direct line terminated with Elizabeth. He became James I. of England and Scotland 1603. His descendants were: Charles I., 1625, Charles II., 1660, James II., 1685, deposed 1688, when his daughter Mary and her husband, William of Orange, succeeded. The male line ceased 1807. The present royal family is descended indirectly from the Stewarts through Elizabeth, daughter of James I.

Stewart, ALEXANDER PETER, b.1821. Brig.-gen. C.S.A. 1861, Major-gen. 1863, Lieut.-gen. 1864; engaged chiefly in Tenn.; chancellor Univ. Miss. 1868.

Stewart, ALEXANDER TURNEY, 1803–1876. Irish-American merchant, founder of the then largest store in New York, and of Garden City, L. I., and its institutions.

Stewart, ALVAN, 1790–1849. Lawyer of Utica, N. Y.; anti-slavery agitator. *Speeches*, 1860.

Stewart, BALFOUR, LL.D., F.R.S., 1828–1887. Director Kew Observatory 1859; Prof. of Physics at Owens Coll., Manchester, 1870; one of the founders of spectrum analysis. His *Radiant Heat*, 1858, established the equality of the emissive and absorptive powers of bodies. Particularly valuable are his papers on the earth's magnetism. *Treatise on Heat*, 1866; *Elements of Physics*, 1870; *Conservation of Energy*, 1873.

Stewart, CHARLES, U.S.N., 1778–1869. Lieut. 1798, Captain 1806; distinguished in the wars with France, Tripoli, and England; in command of the Mediterranean and Pacific squadrons 1816–23; Commodore 1856, Rear-admiral 1862; grandfather of C. S. Parnell.

Stewart, DUGALD, 1753–1828. Prof. Edinburgh 1775–1810, disciple of Reid, advocate of the doctrine of common sense. *Elements of the Philosophy of the Human Mind*, 1792–1814; *Outlines of Moral Philosophy*, 1793; *Hist. Ethical Philosophy*, 1815–21; *Active and Moral Powers*, 1828.

Stewart, ELLIOTT WILLIAM, 1817–1894. American agricultural writer. *Feeding Animals*, 1883.

Stewart, ESME, ab.1555–1583. French intriguer of Scottish descent, cousin of James VI.; in Scotland 1579–82; enemy of Morton; Earl of Lennox 1580, Duke 1581; banished as a traitor 1582.

Stewart, MATTHEW, EARL OF LENNOX, ab.1510–1571. Father of Darnley, and grandfather of James VI. of Scotland; regent 1570; killed near Stirling.

Stewart, MATTHEW, 1717–1785. Prof. Edinburgh 1747–72. *Theorems*, 1746; *Tracts Physical and Mathematical*, 1761; *Propositiones Geometricæ*, 1763.

Stewart, ROBERT. See CASTLEREAGH, VISCOUNT.

Stewart, ROBERT MERCELLUS, 1815–1871. Gov. of Mo. 1857–61; promoter of railways.

Stewart, WILLIAM, D.D., b.1835. Prof. Glasgow 1873; theological writer.

Stewart, WILLIAM MORRIS, b.1827. U. S. Senator from Nevada 1864–75, and since 1887.

Stewart Island. S. constituent of New Zealand. Area 665 sq. m.

Stewart's Actinometer. Black bulb thermometer within a massive inclosure of iron, whose temperature changes slowly. The sun's rays are admitted to it for one minute and then cut off; its changes of temperature give the data for computing the radiation. See also BOLOMETER and PYRHELIOMETER.

Stewing. Method in cookery, used to prepare meats, differing from boiling in that only a small amount of water is added, and the heat gently applied. Meat prepared in this way is very tender and retains its savor, but is not very digestible.

Steyn, MARTHINUS THEUNIS, b.1857. Judge in Orange Free State, S. Africa, 1889; Pres. 1895.

Stibine. See ANTIMONIURETED HYDROGEN.

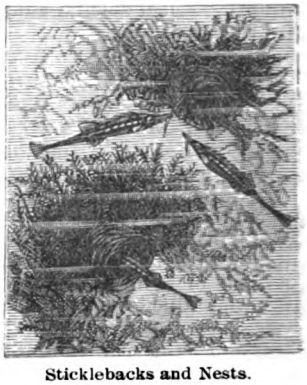
Stibnite. Sb_2S_3. Soft, lead-gray mineral, so easily fusible that a low heat suffices to separate it from the gangue. Workable deposits are found in Cal. and Nevada. Other important localities are in New Brunswick, Germany, Portugal, Borneo, and Australia. See ANTIMONY.

Stichid. Certain swollen branches of some of the red *Algæ*, containing the spores.

Stickeen. River of the n.w. coast of N. America, heading in the mountains of British Columbia and flowing across s.e. Alaska to the Pacific. Length 500 m.

Sticking Plaster. ADHESIVE PLASTER (q.v.).

Stickleback. Acanthopterygian fishes of the genus *Gasterosteus*, consisting of many species, several of which are American. They differ principally in their number of spines, and are named accordingly. See ACANTHOPTERI and GASTEROSTEIDÆ.



Sticklebacks and Nests.

Stickseed. Herbs of the genus *Lappula*, natural family *Boraginaceæ*, bearing prickly fruits; natives of n. temperate zone.

Stieler, ADOLF, 1775–1836. German cartographer. *Atlas*, 1817–23.

Stier, RUDOLF EWALD, 1800–1862. German commentator. *Words of the Lord Jesus*, 8 vols., tr. 1855–58; *Words of the Apostles*, tr. 1869.

Stifel, MICHAEL, 1487–1567. Augustine monk, adherent and friend of Luther. *Arithmetica Integra*, 1544.

Stigma. Summit of the pistil of flowers. It is devoid of epidermis and receives the pollen discharged from the anthers.

Stigmaria. Branching roots found in the Coal Measures, probably both of *Lepidodendron* and *Sigillaria*, with long, cylindrical rootlets, articulated to the main axis. See LEPIDODENDREÆ.

Stigmata. 1. Breathing pores of Insects and Arachnids. 2. Openings in the pharyngeal sac of Tunicates. 3. Openings of the segmental ducts of Leeches, etc.

Stigmata. Wounds like those of Christ, regarded as miraculously inflicted. The first example is found in the life of St. Francis of Assisi. Names of many, chiefly women, thus marked, are recorded, and cases are reported nearly to our own day. It is called Stigmatization.

Stilbene. $C_{14}H_{12}$. Diphenylethylene. Solid hydrocarbon, crystallizing in plates; mpt. 126° C.; prepared usually by the action of hot lead oxide on toluene, but also by that of heat on many aromatic substances. It unites directly with bromine.

Stilbite. One of the zeolite family of minerals; hydrous calcium aluminium silicate with some sodium, frequently occurring in cavities in igneous rocks, with its small crystals grouped in bunches of sheaf-like form.

Stiles, EZRA, D.D., LL.D., 1727–1795. Pres. Yale from 1778.

Stiles, HENRY REED, M.D., b.1832. Homeopathic practitioner and teacher in New York; genealogist. *Hist. Brooklyn*, 1867–84.

Stilicho, ab.359–408. General of Vandal origin; commander-in-chief under Theodosius; guardian and father-in-law of Honorius. He repressed the revolt of Gildo 398, forced Alaric to retreat 403, and crushed Radagaisus at Fiesole 405.

Still. See DISTILLATION and RETORT.

Still, JOHN, D.D., ab.1542–1607. Prof. Cambridge 1570; Bp.

of Bath and Wells 1592; author of *Gammer Gurton's Nedle*, 1575, the earliest English comedy except *Ralph Royster Doyster*.

Still Born. Delivery of a dead child. The determination of this fact is an important medico-legal question, in cases of supposed infanticide. If the child has breathed, then it is not a still birth, but the converse of the proposition is not always true.

Stille, ALFRED, M.D., LL.D., b.1813. Prof. Univ. Pa. 1864–84. *Pathology*, 1848.—His brother, CHARLES JANEWAY, b.1819, was provost Univ. Pa. 1868–80. *Hist. U. S. Sanitary Commission*, 1866; *Mediæval History*, 1881.

Stilling, JUNG. See JUNG-STILLING.

Stillingfleet, EDWARD, D.D., 1635–1699. Dean of St. Paul's 1677, Bp. of Worcester 1689; theologian and controversialist. *Irenicum*, 1659; *Origines Sacræ*, 1662; *Grounds of the Protestant Religion*, 1664; *Origines Britannicæ*, 1685; *Doctrines and Practices of Ch. of Rome*, 1686; *Doctrine of the Trinity*, 1697. *Works*, 6 vols., 1710.

Stillman, WILLIAM JAMES, b.1828. American author and artist; Consul at Rome 1861–65, and in Crete 1865–69; resident in Europe. *Acropolis of Athens*, 1870; *Cretan Insurrection*, 1874; *Herzegovina*, 1877; *On the Track of Ulysses*, 1887.

Stillwater. Capitol of Washington co., Minn., on St. Croix Lake, 18 m. n.e. of St. Paul. It has a large trade in lumber. Pop., 1890, 11,260.

Stillwater, BATTLE OF. See SARATOGA.

Stilo, LUCIUS, or ÆLIUS STILO, ab.100 B.C. Roman knight, considered the best learned man of his time, first Roman philologist, and teacher of Cicero and Varro.

Stilted Arch. This has the capital of the jambs below the springing of the curve, the moldings extending down to the impost.

Stilton Cheese. See CHEESE.

Stilts. Poles or crutches to raise the feet above the ground in walking. From the Maya MMS. it appears that they were anciently employed by the priests in their ceremonies in Central America; and elaborately carved specimens for ceremonial use occur in the Marquesas islands. They are a common means of amusement among boys in e. Asia, being known in Japan as Bamboo horses.

Stilwell, SILAS MOORE, 1800–1881. New York lawyer and writer on finance; framer of U. S. Banking Act, 1863.

Stimpson, WILLIAM, 1832–1872. Naturalist to n. Pacific expedition 1852–56; curator to Chicago Academy of Sciences 1864. *Crustacea*, 1857–71.

Stimson, FREDERIC JESUP (J. S. OF DALE), b.1855. American novelist and law-writer. *Guerndale*, 1882; *Crime of Henry Vane*, 1884; *Statute Law*, 1886; *First Harvests*, 1888; *Residuary Legatee*, 1888; *Labor in its Relations to Law*, 1895; *Pirate Gold*, 1896; *King Noanett*, 1897.

Stimulant. In Therapeutics, a remedy that increases the manifestation of the functional activity of a part. It is applied more especially to those drugs which increase the power and force of the circulation, either with or without the increase of the pulse rate. Ammonia is one of the most rapid in its action; alcohol is the one most commonly used, although it is not now thought to be good practice to administer alcohol in shock. Apart from the cardiac stimulants, there are stimulants of the skin, of the liver, etc., those that act locally (directly on the sensory nerves) or generally through the circulation.

Stimulus. In Physiology and Psychology, influence causing a functional reaction.

Sting. See ACULEUS.

Stink-Horns. *Fungi* of the order PHALLOIDEÆ (q.v.).

Stink-Pot. Shell or receptacle containing a mixture of combustible and foul-smelling substances, which when set on fire will emit a suffocating odor, and by this means withhold the enemy from advancing; said to have been a favorite weapon of the Chinese.

Stinkstone. Variety of limestone, which emits sulphureted hydrogen gas upon being struck with a hammer, which is in most cases due to imbedded organic matter.

Stipe. Stalk of a mushroom or toadstool; also, stem-like stalks of certain *Algæ*, slender stems of tree-ferns, and naked stalks of acaulescent flowering plants and other plant organs.

Stipels. Small attachments at the bases of leaflets in a compound leaf, as in the Bean and Wistaria.

Stipend Class. Persons employed, not as a means to increase the income of their employers, but for purposes of comfort, leisure, or luxury, or for the cultivation of art and the intellect; as menial servants, physicians, teachers of science, and artists.

Stipple Engraving. For this variety of engraving an etching ground is laid, and the subject is transferred in the usual way. The design is then worked in with small dots punctured through the etching ground with a graver, or needle. The closer together the dots are placed, the darker the tones become, after the plate has been subjected to the acid bath. The plate is then finished with the dry point or graver. This method is much used for portraits. It was first used by Jean Charles François, 1717–1769, a French engraver; Francesco Bartolozzi was the most noted stipple engraver.

Stipular. Resembling or pertaining to stipules.

Stipules. Pair of lateral out-growths at the base of the leaf-stalk in many flowering plants. They are characteristic of some families, and wanting in others.

Stirling. Old town of Scotland, 29 m. n.n.e of Glasgow; noted for its castle, relics, and memories of the past. Here Wallace defeated the English under Warrenne, Sept. 10, 1297. Pop., 1891, 16,974.

Stirling, JAMES HUTCHISON, LL.D., b.1820. Scottish philosopher. *Secret of Hegel*, 1865; *Sir W. Hamilton*, 1865; *Protoplasm*, 1869; *Text-book to Kant*, 1881; *Philosophy and Theology*, 1890.

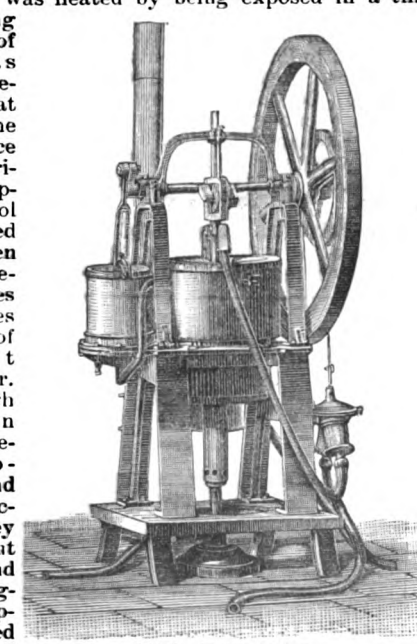
Stirling, SIR THOMAS, ab.1735–1808. Scottish officer, in America ab.1757–83; Brig.-gen. 1780, Major-gen. 1782, Baronet 1796, General 1801.

Stirling, WILLIAM ALEXANDER, EARL OF, ab. 1567–1640. Scottish poet and dramatist, knighted 1609; grantee of Nova Scotia 1621; Sec. of State for Scotland from 1626; sole publisher of King James's Psalms 1631; Viscount 1630, Earl 1633. *Tragedies*, 1607; *Doomesday*, 1614–37; *Recreations*, 1637; *Poems*, 3 vols., 1870. The title expired 1739.

Stirling, WILLIAM ALEXANDER, called LORD, 1726–1783. Revolutionary patriot. In his youth he entered the British army, becoming aid-de-camp to Gov. Shirley. He entered the Revolutionary army 1775; Brig.-gen. 1776, Major-gen. 1777; in command of New York 1776. He was one of the founders and first governor of Columbia College.

Stirling-Maxwell. See MAXWELL.

Stirling's Engine. Form of air-engine originated by Rev. Robert Stirling 1816, and improved by James Stirling. The same volume of air was heated by being exposed in a thin film over the heating surface at one end of a cylinder. It was then passed over a refrigerating surface at the other end of the cylinder, such surface being given by a horizontal coil of fine copper pipe, in which cool water was circulated by a pump. Between the heater and the refrigerator was a series of thin vertical plates of oblong shape, of metal or glass, put very close together. The air passed through the spaces between these plates of the regenerator or economizer, on the rise and descent of the displacing piston, so that they alternately gave out and absorbed heat, and the heater and refrigerator had only to supply what was wasted by imperfect action of the regenerator. This was the first application of this principle of regeneration in an air-engine. The working cylinder was separate from the heating cylinder, so that the working piston did not touch the hot air; lubrication was less complicated; the displacing plunger did not touch the walls of the heater, and was filled with brick-dust or other non-conductor. Such an engine developed 20 horse-power on a consumption of 50 lbs. of coal per hour.



Stirling's Air-engine.

Stitch. In Surgery, a single loop or knot of a SUTURE (q.v.). —As a symptom, a sudden, sharp, lancinating pain, as the pain in the side from an attack of pleurisy or pleurodynia (rheumatism of the walls of the chest).

Stitchwort. White-flowered herbs of the genus *Alsine*, natural family *Caryophyllaceæ*, natives of the n. temperate zone, especially abundant in the cooler regions.

Stith, WILLIAM, 1689–1755. Pres. William and Mary Coll. 1752. *History of Virginia*, 1747.

Stiver. Coin of Holland and British Guiana; value ab. 2 cents.

Stjernhjelm, GEORG, 1598–1672. "Father of Swedish poetry." His works were reprinted 1856.

Stobæus, JOANNES, ab.500. Greek compiler of literary extracts. In his *Eclogæ* and *Florilegium* he quotes over 500 authors: the fragments given are of great value.

Stobo, ROBERT, 1727–after 1780. Scottish-American officer, prisoner at Quebec 1755–58; condemned as a spy 1756 for making a plan of Fort Duquesne: hero of Gilbert Parker's romance, *In the Seats of the Mighty*, 1896. *Memoirs*, 1800, repub. 1854.

Stock. Generally, money or property put into corporate funds by subscribers who become members of a corporation; commonly represented by certificates, whose form, method of transfer, and legal characteristics are determined by statutes and commercial usage.

Stockach. See OSTRACH.

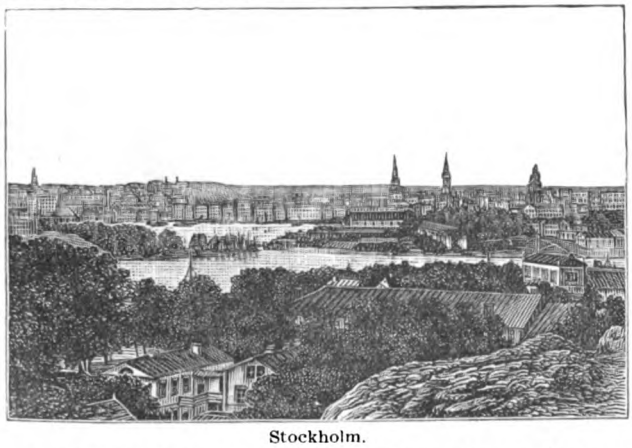
Stockade. Strong palisade of closely joined heavy timbers, built across the gorge of a lunette or other advanced work, whose rear is commanded by the works of the main position.

Stockbridge, FRANCIS BROWN, 1826–1894. U. S. Senator from Mich. 1887.

Stockbridge, LEVI, b. 1820. Prof. Mass. Agricultural Coll. 1867, pres. 1880–82; introducer of special fertilizers.—His brother, HENRY, 1822–1895, was a lawyer, judge, and reformer in Baltimore. *Archives of Md.*, 1886.

Stock Exchange. Association of brokers in the securities of nations, states, counties, municipalities or corporations. Grain, petroleum and silver certificates have also been dealt in at some stock exchanges. New York Stock Exchange originated in 1792. The number of members is limited to 1,100. Applications for membership must be approved by a committee, but the right to a seat is sold by its owner or heirs, subject to this approval; these rights have sold at $15,000 to $30,000 each. London Stock Exchange was established in 1801; it has more than 3,000 members, entrance fee 500 guineas, annual dues 30 guineas. The Paris Bourse has 60 members. Many of the large cities in the U. S. and Europe have stock exchanges. The securities dealt in must be approved by a committee. The commission charged to outsiders is, in New York, ⅛ of 1 per cent; in Paris 1 per cent; in London ¼ of 1 per cent on U. S. securities. Clearing-house for stocks was established at Frankfort 1867, London 1876, New York 1892. The latter also has a system of money clearings for members. In the New York Stock Exchange 66,440,576 shares were sold in 1896; in 1882 there were sold 113,720,655 shares. See ARBITRAGE, BOND, BULLS AND BEARS, CLEARING-HOUSE, CORNER, OPTIONS, and STOCK.

Stockholm. Capital of Sweden, on the Baltic, at the mouth of an inlet known as Lake Mælar; founded ab. 1180; taken by Danes 1389 and 1520; scene of a massacre 1520. The



Stockholm.

harbor is excellent. The city is built partly on shore and partly on islands. It is beautifully laid out, and has a large commerce, and several academies and museums. Its chief growth is recent. Pop., 1890, 246,151.

Stockings. See HOSIERY.

Stockmar, CHRISTIAN FRIEDRICH, FREIHERR VON, 1787–1863. Physician and adviser to Leopold and Albert of Coburg; baron 1831; long in England. *Notabilia*, tr. 1872.

Stockport. Borough of Cheshire, on the Jersey, 6 m. s.s.e. of Manchester. It has large cotton manufactures. Pop., 1881, 59,553. Pop., 1891, 70,253.

Stocks. Boards with holes to confine the feet, and sometimes hands also, of culprits; much used in England from ab. 1350 till recently, and to some extent in America. See PILLORY.

Stockton. Capital of San Joaquin co., Cal., in San Joaquin valley, 103 m. e. of San Francisco; settled 1849; center of wheat trade. Pop., 1890, 14,424.

Stockton, FRANCIS RICHARD, b.1834. American humorist, whose chief vehicle is the short story. His effects depend on fantastic or unexpected situations, as in *The Lady or the Tiger?* 1884; *Rudder Grange*, 1879; *The Late Mrs. Null*, 1886; *Mrs. Lecks and Mrs. Aleshine*, 1886; *The Hundredth Man*, 1887; *Squirrel Inn*, 1891; *Captain Horn*, 1895; *Great Stone of Sardis*, 1897.—His half-brother, THOMAS HEWLINGS, 1808–1868, M. P. pastor in Phila. and reformer, wrote much in prose and verse.

Stockton, RICHARD, 1730–1781. Councilor of N. J. 1768; Judge of Supreme Court 1774; in Congress 1776; signer of the Declaration of Independence; prisoner in New York 1776, and sufferer in person and estate.—His son, RICHARD, LL.D., 1764–1828, was U. S. Senator 1796–99 and M.C. 1813–15.—His son, ROBERT FIELD, U.S.N., 1795–1866, Captain 1838, Commodore 1845, presided at the annexation of Cal. 1846, formed a State government there, left the navy 1850, and was U. S. Senator 1851–53.—His son, JOHN POTTER, LL.D., b.1826, was U. S. Minister to Rome 1857–61, Senator 1869–75, and Atty.-gen. of N. J. 1877–92.

Stockton-on-Tees. Seaport of Durham, near the mouth of the Tees. It has a large commerce in coal and iron. Pop., 1891, 68,895.

Stockwerk. Ore deposit of such character originally that it is best worked in stories or floors like those of a house; commonly a rock mass of irregular form, traversed in many directions by numerous small veins of ore, but not associated with any deep-seated fissure.

Stoddard, CHARLES AUGUSTUS, D.D., b.1833. Ed. *New York Observer* from 1883; author of books of travel.

Stoddard, CHARLES WARREN, b.1843. American author. *South Sea Idyls*, 1873; *Mashallah*, 1881.

Stoddard, DAVID TAPPAN, 1818–1857. American missionary in Persia 1843–48 and from 1851; writer in Syrian.

Stoddard, JOHN F., 1825–1873. American author of widely circulated text-books on Arithmetic, 1852–69.

Stoddard, RICHARD HENRY, b.1825. American poet and journalist.—His wife, ELIZABETH DREW (BARSTOW), b.1823, m. 1851, pub. 3 novels, *The Morgesons*, 1862; *Two Men*, 1865; and *Temple House*, 1867.

Stoddard, WILLIAM OSBORN, b.1835. American author, especially of books for boys. *Dab Kinzer*, 1881; *Lives of the Presidents*, 1886–89.

Stoddart, JAMES HENRY, b.1827. Anglo-American actor.

Stoddert, BENJAMIN, 1751–1813. First Sec. U. S. Navy, 1798–1801.

Stoeckel, GUSTAVE JACOB, b.1819. German-American organist and composer.

Stoever, MARTIN LUTHER, LL.D., 1820–1870. Prof. Pa. Coll., Gettysburg, from 1844; ed. *Evangelical Quarterly* from 1857.

Stoics. School of Greek philosophers, named from the stoa or porch, where they taught. Their philosophy was pantheistic in type and their ethics ascetic. Zeno (ab.310), Cleanthes, and Chrysippus were famous at Athens, Seneca, Epictetus, and Marcus Aurelius later in Rome: the two latter represent paganism at its ideal height of theory and practice. In common parlance, stoicism means the superiority of the mind to pain, pleasure, and the accidents of life.

Stoke, BATTLE OF. Near Newark, Nottinghamshire, June 16, 1487; defeat of Lambert Simnel the pretender by Henry VII.

Stokes, SIR GEORGE GABRIEL, b.1819. Prof. Cambridge 1849; M.P. 1886–93; Baronet 1889. *Mathematical and Physical Papers*, 1880–83; *Light*, 1887. See STOKES' LAW.

Stokes, JONATHAN, 1755–1831. English botanist. *Botanical Materia Medica*, 1812; *Botanical Commentaries*, 1830.

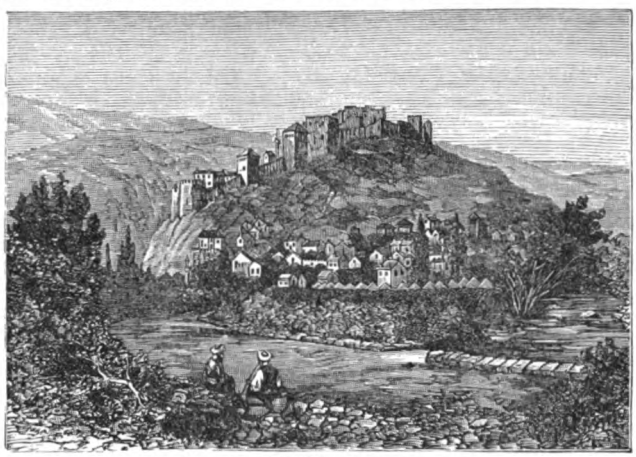
Stokes, MONTFORD, 1760–1842. U. S. Senator 1817–23; Gov. of N. C. 1830–31; Indian agent for Ark. 1831.

Stokes, WILLIAM, M.D., 1804–1877. Prof. Dublin 1845; medical writer.—His son, WHITLEY, b.1830, long in India, has edited sundry Celtic MSS. *Hindu Law Books*, 1865; *Anglo-Indian Codes*, 1887–88.

Stokes' Law. A body which when cold absorbs any particular kind of radiation will in general when heated emit radiation of the same kind. The same law applies to sounding bodies, as is shown in the phenomena of sympathetic vibrations.

Stoke-upon-Trent. Borough of Staffordshire, noted for its products of earthenware. Pop., 1891, 75,352.

Stolatz. Town of Herzegovina, 20 m. s.e. of Mostar. The surrounding country is mountainous and is a famous wine



Stolatz.

producing district. Scene of operations in the war between Russia and Turkey. Pop. ab.4,000.

Stolberg, FRIEDRICH LEOPOLD, GRAF VON, 1750–1819. German poet, translator, and religious writer.—His brother, CHRISTIAN, 1748–1821, was also a poet.

Stole. Scarf worn over the surplice by Latin and Anglican clergy.

Stolon. In Botany, slender creeping branch, produced from the base of a plant, striking root from its apex, and thus developing a new individual.

Stolon. In Zoölogy, process of the body from which zoöids are produced by budding or by segmentation, as in the proliferating stolon of Ascidians. It forms the connecting tube of the zoöids of a colony.

Stolz, FRIEDRICH, b.1850. Prof. Innsbruck 1887; writer on Latin grammar.

Stolzite. $PbWO_4$. Mineral lead tungstate, first found in Bohemia.

Stomach. Largest of the organs of digestion, situated on the left side of the body in front. It is partly covered by the ribs, but extends below their border. The food is conveyed from the mouth by the act of SWALLOWING (q.v.), and remains in the stomach for a varying length of time, in some cases for hours. The muscular fibers of the stomach are so arranged as to give the contents a churning motion, by which they are thoroughly mixed with the gastric secretions, more especially the pepsin which changes the proteids, or food-compounds containing nitrogen, into peptones. The partially digested mass, when the stomach digestion is complete, is called chyme.

Stomach Pump. Instrument for removing the contents of the stomach by mechanical means. A tube is introduced through the mouth and œsophagus, and the contents of the stomach is drawn out by producing a vacuum in the tube, either by the direct action of the pump or by means of a closed vessel to which the tube is attached and in which a partial vacuum has been made.

Stomadæum. Ectodermal invagination in the embryo, which produces the mouth cavity.

Stomata. Transpiration orifices in the epidermis of plants which open into the interior of leaves, stems, etc., affording free interchange of the gases within the plant with those of the atmosphere.

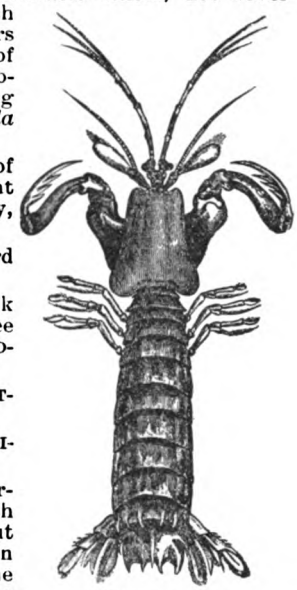
Stomata, or STOMATODE INFUSORIA. Most of the *Ciliata;* characterized by possessing a definite mouth orifice.

Stomatitis. Inflammation of the mouth. Four or five varieties are recognized, from the simplest form, attended by a slight reddening of the membranes, to the gangrenous form accompanied by extensive sloughing.

Stomatodendra. Polystomous, oval lobes of the *Rhizostomidæ.* They are much branched, bear many short tentacles, and are fused one with another, forming a large root-like mass dependent from the under surfaces of these jelly-fishes.

Stomatophora. See INFUSORIA.

Stomatopoda. Sub-order of *Thoracostraca,* characterized by having a short cephalothoracic shield, not covering the thoracic segments, which are movable. There are five pairs of maxillipeds, and three pairs of biramous thoracic feet. The abdomen is strong; its swimming feet bear branchial tufts. *Squilla* is an example.



Squilla mantis.

Stone. English legal weight of 14 lbs.; locally, of varying amount for different articles, as wool, hay, and meat.

Stone. In Botany, pit or hard endocarp of a drupe.

Stone. In Engineering, rock suitable for building purposes. See BUILDING STONE, LIMESTONE, SANDSTONE, etc.

Stone. See CALCULI, LITHOTRITY, and LITHOTOMY.

Stone, ARTIFICIAL. See ARTIFICIAL STONE and BETON.

Stone, STRENGTH OF. The average ultimate compressive strength of stone is 5,000 lbs. per sq. in., but this is subject to much variation with the kind and quality of the stone. Small blocks also are stronger than large ones.

Stone, BARTON WARREN, 1772–1844. Evangelist in Ky.; founder, with a few others, of a non-Calvinistic "Christian Ch.," on a basis of religious liberty.

Stone, CHARLES POMEROY, 1824–1887. He served in the Mexican War; in 1857 he was engaged in surveying Sonora and Lower California; Brig.-gen. U. S. Vols. 1861–64, serving in Va. and La.; in the Egyptian service 1870–83.

Stone, DAVID, 1770–1818. Judge of N. C. Supreme Court 1795–98 and 1807; M.C. 1799–1801 and 1811–13; U. S. Senator 1801–7 and 1813–14; Gov. of N. C. 1808–10.

Stone, DAVID MARVIN, 1817–1895. Ed. New York *Journal of Commerce* 1849–93. *Frank Forest,* 1849.

Stone, JOHN AUGUSTUS, 1801–1834. American playwright. *Metamora.*

Stone, JOHN SEELY, D.D., 1795–1882. Rector in Boston, Brooklyn, and Brookline, Mass.; Dean Cambridge Theol. School 1867–75; religious writer.—His son, JAMES KENT, D.D., b.1840. Pres. Kenyon Coll. 1867 and Hobart Coll. 1868–69, entered R. C. Ch. 1870. *Invitation Heeded,* 1870.

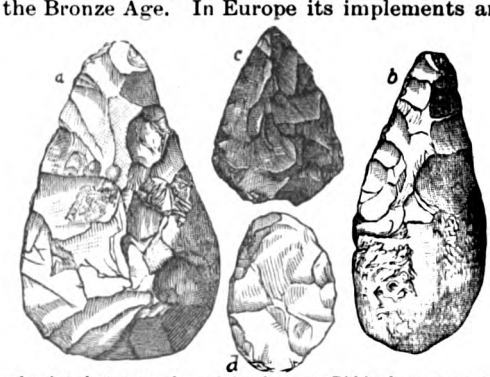
Stone, LUCY, 1818–1893. American advocate of Woman's Rights; ed. *Woman's Journal* from 1870. She became Mrs. H. B. Blackwell 1855, but retained her maiden name.

Stone, SAMUEL JOHN, b.1839. English hymnist.

Stone, THOMAS, 1743–1787. Delegate to Congress from Md. 1775–77 and 1783–84; signer of the Declaration of Independence. —His great-grandfather, WILLIAM, was Gov. of Md. 1649–55.

Stone, WILLIAM LEETS, 1792–1844. American historical writer, as is his son and namesake, b.1835.

Stone Age. Prehistoric era (in lands now civilized) preceding the Bronze Age. In Europe its implements are classi-



a, round-pointed, tongue-shaped implement, Biddenham, near Bedford; *b,* acutely-pointed implement made from rounded nodule of flint, St. Acheul, near Amiens; *c,* from Bemerton, Wilts; *d,* irregularly-ovate, sharp-rimmed instrument, Moulin Quignon, Abbeville.

fied as paleolithic and neolithic. It does not refer to general chronology, but to a period in the development of each race. Certain races of the South Sea islands belong to the stone age of the 19th century.

Stone Bridges. See ARCHED BRIDGE.

Stone Canal. Tube which leads from the madreporic plate to the circumoval water-tube of Starfishes. Its walls are calcified.

Stone Circles. See STANDING STONES.

Stonecrop. Herbs of the genus *Sedum*, natural family *Crassulaceæ*, with fleshy leaves and showy flowers; of wide geographical distribution.

Stonecrop, DITCH. *Penthorum sedoides.* Insignificant herb of the natural family *Crassulaceæ*, growing in wet places in e. N. America.

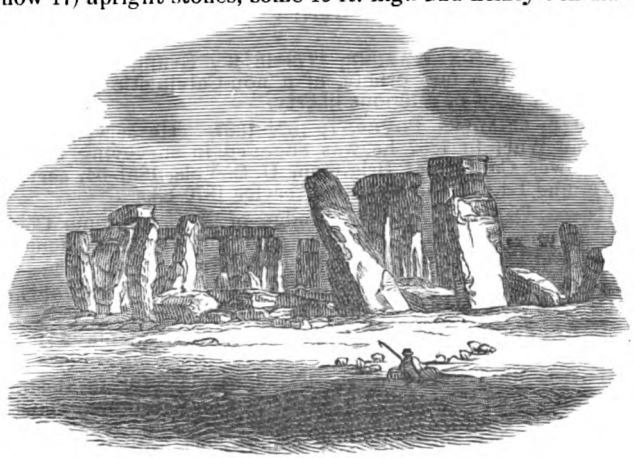
Stone Crusher. Portable machine having jaws in which stones are crushed for street pavements, for making concrete, etc. One jaw is stationary, while the other is moved by a cam which is driven by machinery. See ROCK CRUSHER.

Stone Fougass. Excavation in front of the covered way in the form of a cone frustrum, placed so as to have its greater opening looking toward the probable line of advance of the enemy. In it is placed a charge of powder and a collection of stones and other missiles, which, when the charge is fired, will do damage to the enemy. This is a device of the earlier sieges.

Stone-Fruit. See DRUPE.

Stonehead. In Mining, point where solid rock is first struck in sinking a shaft.

Stonehenge. On Salisbury Plain, Wiltshire; rude stone structures, consisting of 2 circles and 3 ovals with a large central stone, 15 ft. long, supposed to have been used for an altar. The outer ring, ab. 300 ft. in circumference, was formed of 30 (now 17) upright stones, some 16 ft. high and nearly 6 in diam-



Stonehenge.

eter, supporting 30 (now 7) others, laid horizontally on their tops. The inner circle had 40 smaller stones, the inner oval 19; a vallum and ditch of 1,100 ft. inclosed all. It was formerly thought to be of Druidical origin; and is of uncertain date. It is now generally considered to have been a burial place of the bronze-age people. Other groups of standing stones exist in various parts of Gt. Britain; one at Carnac, France, has over 1,000 still erect.

Stone Implements. See NEOLITHIC CAVES, NEOLITHIC MAN, PALEOLITHIC MAN, and STONE AGE.

Stoneman, GEORGE, U.S.A., 1822–1894. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862–66; active in Va. and Ga., chiefly with cavalry commands; retired 1871; Gov. of Cal. 1883–87.

Stone Mortar. Large caliber bronze mortar for firing baskets of stones upon the besiegers, when near the covered way. Several of these, captured at the castle of Perote in the Mexican war, are among the trophies at West Point.

Stone River. See MURFREESBORO.

Stone-Root. See HORSE-BALM.

Stones, PRECIOUS. See PRECIOUS STONES.

Stone Throwing. Sport among street boys in American and European cities; national sport in e. Asia, especially Corea. In s. China, in the 1st month, the peasants of neighboring villages meet on the plains and attack each other with stones, the encounters being serious affairs, often attended with loss of life.

Stoneware. See PORCELAIN and POTTERY.

Stoneworts. See CHARACEÆ.

Stonington. Town of New London co., Conn., on L. I. Sound; assailed by British vessels 1814. Pop., 1890, 7,184.

Stony Point. In Rockland co., N. Y., on the Hudson; British stronghold, stormed by Gen. Wayne on the night of July 15, 1779. The British lost ab. 600 men, the Americans 98.

Stool of Repentance. In Scotland, stool in front of the pulpit or other prominent place, on which the subject requiring ecclesiastical discipline stood bareheaded, barefooted and clothed in sackcloth during the sermon. It was in use during the 18th century, but during the first half of the 19th century the public rebuke took its place.

Stoop and Room. In Scotland, method of coal mining similar to the pillar and stall method.

Stoping. In Vein Mining, method of working in which the ore is removed in successive stopes (or steps), in such way that the working-places present the appearance of a flight of steps as seen from above (underhand stoping), or from beneath (overhand).

Stoppage in Transit. Exercise of the right of an unpaid vender of goods to stop them while in transit, and regain possession thereof, on the buyer's insolvency.

Stop Valve. For preventing water from flowing from one pipe into another.

Storage Battery. See ACCUMULATOR.

Storage Reservoir. One in which water is stored, either to allow it to settle, or to provide a supply for dry months. Hence it is led into distributing reservoirs, and thence to the street mains. It is built both for purposes of irrigation and for the water supply of towns. San Mateo reservoir for San Francisco holds 31,000 million gallons; the new Croton reservoir for New York will hold 32,000 million gallons.

Storax. Shrubs and small trees of the genus *Styrax*, natural family *Styracaceæ*, natives of the s.e. U. S.

Storer, BELLAMY, LL.D., 1798–1875. Prof. and judge in Cincinnati; M.C. 1835–37.—His brother, DAVID HUMPHREYS, M.D., LL.D., 1804–1891, pub. *Fishes of N. America*, 1846, and *Fishes of Mass.*, 1853–67.—His son, HORATIO ROBINSON, M.D., b.1830, pub. *Why Not?* 1866, *Is it I?* 1867, and *Nurses and Nursing*, 1868.—His brother, FRANCIS HUMPHREYS, b.1832, prof. Harvard from 1870, pub. *Agriculture in its Relations with Chemistry*, 1887.—His cousin, GEORGE WASHINGTON, U.S.N., 1789–1864, became captain 1837 and rear-admiral 1862.

Stores, MILITARY. Arms, ammunition, clothing, camp and garrison equipage, provisions and all other articles needed for the equipment and support of an army.

Storey, WILBUR FISK, 1819–1884. Proprietor Chicago *Times* from 1861; prominent and influential in Western journalism.

Storks. Heron-like Old World birds, with anterior toes united at base, hind toe elevated, imperfect syrinx; hence voiceless except when clattering the mandibles together. They are diurnal and solitary except when migrating, when they travel in wedge-shaped flocks, flying with neck outstretched, unlike herons. 24 species are known, including the Wood-ibis,

Storks (*Ciconia alba*).

Jabiru, Adjutant, etc. The white-bellied black stork of Africa builds on houses, and is protected, like the sacred Ibis. The ordinary European stork (*Ciconia*) is white, with red beak and legs, and is held to be a bird of good omen. The same pair return to their old nest after wintering in the south, year after year. They feed on frogs, mice, etc., and stand over 3 ft. high. See HERODII.

Storksbill. Herbs of the genus *Erodium*, natural family *Geraniaceæ*, of wide geographical distribution.

Storm, GREAT. Nov. 26–27, 1703; one of the most terrible that ever raged in England. The loss on land and sea was immense. In London property worth £2,000,000 is said to have been destroyed, and 800 lives lost in s. England and Holland. 12 men-of-war in sight of shore, with 1,800 men, were lost. 17,000 trees were torn up in Kent. The Eddystone lighthouse was destroyed, with Winstanley, its designer. Multitudes of sheep and cattle perished.

Storm, JOHAN FREDERIK, b.1836. Prof. Univ. Christiania 1873; writer on Norse, English, and French philology.

Storm, THEODOR WOLDSEN, 1817–1888. German lyric poet and writer of tales.

Storm Circle. Diagram used by Reid to assist in determining the directions of the winds within the area of a cyclonic storm. These are constructed of transparent paper or horn, and were originally adapted to the circular theory of wind circulation, but are now made in accord with the observed spiral movement.

Storm Drum. Drum signal displayed by English and European weather bureaus to forewarn the approach of storm winds.

Storming Party. Troops selected to storm a breach in the works or to assault a position of exceptional danger. It is sometimes the practice to ask for volunteers for such exceptional service.

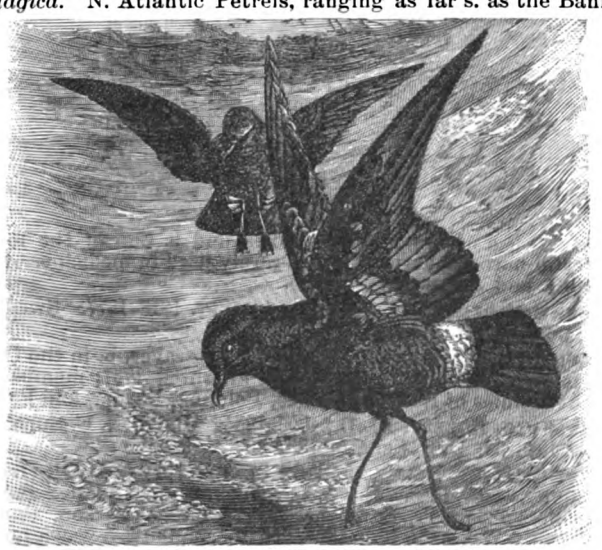
Storm's Eye, or OJO. Calm and fair spot at the center of a revolving storm, technically called Storm center, Low, or Vortex.

Storm Signal. Any signal displayed to the eye, or audible to the ear, intended to warn of an approaching storm. Otto Guericke in 1659 constructed a large apparatus equivalent to a barometer, which by the rise and fall of an index showed the approach of areas of low pressure with accompanying winds and rain. In 1857 Buys Ballot began in Holland to agitate the necessity and feasibility of the display of public storm signals based on telegraphic reports. In 1860 Admiral Fitzroy began the display of the cone and cylinder system of signals in England, which was soon adopted in all Europe. In 1866 Buys Ballot introduced the Aeroklinoscope signal into the Netherlands. In Oct. 1871 the U. S. Signal Office began the display of its cautionary signal (a red light at night and a red flag with black center by day) for winds over 25 m. per hour; in 1881 special signals for off-shore winds were added, and in 1883 an additional signal for winds stronger than 40 m. per hour. Storm signals of some sort are now displayed at every port of much importance throughout the world. Cannon discharges of minute guns have been tried in a few instances, but are not so effective as balls and flags.

Storm Track, or CYCLONE PATHS. Path over the earth of the central barometric depression characteristic of large storms, not that of the storm wind itself. The rain, wind, and other features of the weather at any place are approximately known when the storm track is known. Charts of storm tracks are published monthly by the U. S. and other government weather bureaus.

Storm Wave. General elevation of water within the region of a storm or area of low barometer, due to the greater hydrostatic pressure all around; also, special high wave caused by wind alone.

Stormy Petrels (MOTHER CAREY'S CHICKENS). *Procellaria pelagica.* N. Atlantic Petrels, ranging as far s. as the Banks



Stormy Petrels (*Thalassidroma pelagica*).

of Newfoundland; ab. size of and resembling swallows. They are believed to be the harbingers of bad weather.

Storrs, RICHARD SALTER, D.D., 1787–1873. Pastor at Braintree, Mass., from 1811; ed. *Boston Recorder*, 1817–25, and *Congregationalist*, 1850–56.—His son and namesake, b.1821, pastor in Brooklyn from 1846, has pub. *Preaching Without Notes*, 1875; *Divine Origin of Christianity*, 1884; *Bernard of Clairvaux*, 1892.

Storthing. Norwegian parliament, said to have been first held at Bergen by Haco V. in 1223. See NORWAY.

Story, JOSEPH, LL.D., 1779–1845. M.C. from Mass. 1809–11; Associate Justice of U. S. Supreme Court from 1811; Prof. of Law at Harvard Coll. from 1829. *Bailments*, 1832; *Commentaries on the Constitution of U. S.*, 1833; *Conflict of Laws*, 1834; *Equity Jurisprudence*, 1835–36; *Agency*, 1839; *Partnership*, 1841. —His *Life* was written by his son and biographer, WILLIAM WETMORE, D.C.L., 1819–1895, sculptor and poet, who lived in Italy from 1848. *Roba di Roma*, 1862–77. Many of his busts and statues are in U. S. and England.

Stosch, ALBRECHT VON, 1818–1896. Prussian general; Commissary 1870, Chief of Admiralty 1872, Admiral 1876–83.

Stothard, THOMAS, 1755–1834. English painter and illustrator, R. A. 1794. Some 4,000 of his designs have been engraved.—His son, CHARLES ALFRED, 1786–1821, painter, pub. *Monumental Effigies*, 1811–23.

Stoughton, EDWIN WALLACE, 1818–1882. New York lawyer; Minister to Russia 1877–79.—His nephew, EDWIN HENRY, U.S.A., 1838–1868, was Brig.-gen. U. S. Vols. 1862–63.

Stoughton, JOHN, D.D., b.1807. Cong. pastor and prof. in London; ed. *Evangelical Mag. Hist. Religion in England*, 9 vols., 1867–84; *Italian Reformers*, 1881; *Recollections*, 1894.

Stoughton, WILLIAM, 1632–1701. Mass. Councilor 1671–89; Lieut.-gov. from 1692; benefactor of Harvard.

Stourbridge Fair. One of the most prominent fairs of England. See FAIR.

Stout. See BEER.

Stove. Close fireplace for warming apartments or cooking. The ancients used stoves which concealed the fire, as the German stoves yet do. They lighted the fire also in a large tube in the middle of the room, the roof being open. Benjamin Franklin pointed out the waste of fuel in our open fires. They are of great diversity of forms, of cast iron, sheet iron, and soapstone. Iron stoves for burning coal are lined with fire-brick. In Asia and parts of Europe stoves are made of brick or clay; in Germany of tile. Stoves are made specifically for wood or coal, but they are also heated by coal-oil lamps, charcoal and gas. A cooking stove called the Aladdin, and invented by Edward Atkinson, greatly economizes heat and controls its operation. One pound of oil does the work of from 50 to 70 lbs. of coal in the ordinary stove. Electric stoves are also coming into use. In 1893 the stove manufactures of the U. S. amounted to $30,035,700.

Stover. Cured stalks of Indian corn from which the ears have been removed. When cut early and properly cured, it has considerable value as a fodder, in some respects nearly if not quite equal to meadow hay.

Stow, BARON, D.D., 1801–1869. Baptist pastor in Boston 1832–67; devotional and historical writer.

Stow, JOHN, 1525–1605. English antiquarian. *Chronicles*, 1561; *Annals*, 1580; *London and Westminster*, 1598.

Stowe, HARRIET ELIZABETH (BEECHER), 1811–1896, m. 1836. American novelist. Her *Uncle Tom's Cabin*, 1852, exerted wide and deep influence in the North and was widely circulated and tr. in Europe; it was supported by a *Key*, 1853. *Sunny Memories*, 1854; *Dred*, 1859; *Minister's Wooing*, 1859; *Pearl of Orr's Island*, 1862; *Agnes of Sorrento*, 1862; *Oldtown Folks*, 1869; and many minor juvenile tales, besides a few fine religious lyrics.—Her husband, CALVIN ELLIS, D.D., 1802–1886, was prof. at Dartmouth 1830–33, Lane Sem., Cincinnati, 1833–50, Bowdoin 1850–52, and Andover 1852–64. He pub. 2 vols. on the Bible, 1835–67.

Stowell, CHARLES HENRY, b.1850. Prof. Univ. Mich. *Histology*, 1882; *Microscopic Diagnosis*, 1882; *Physiology and Hygiene*, 1888.

Stowell, HUGH, 1799–1865. English hymnist.

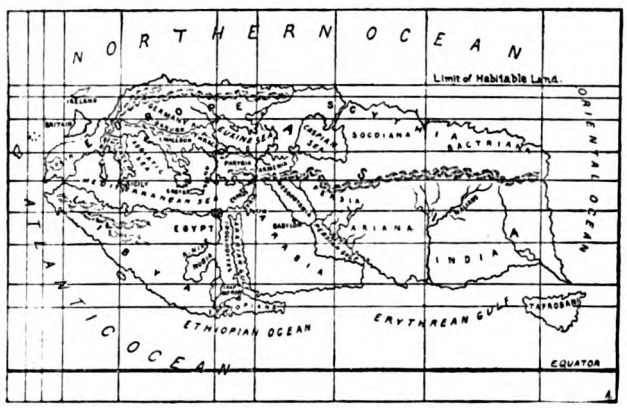
Stowell, WILLIAM SCOTT, BARON, 1745–1836. Brother of Lord Eldon; Judge, Privy Councilor, and Knight 1788; Judge of Admiralty 1798–1828; Baron 1820.

Stowing. In Mining, filling in of underground excavations with rock or worthless material to prevent the overlying rock from sinking.

Strabismus. Visual defect in which there is a lack of harmony in the position of the eyes; one eye is fixed or looking at the object, the other eye deviates. This deviation may be in any direction, but is constant in each instance. The most common directions of deviation are directly toward the

nose, strabismus convergens; or outwardly, strabismus divergens. It may be due to a paralysis of some of the muscles that move the eye, or to some defect or difficulty in vision. One eye alone may deviate or the strabismus may alternate. In many cases of converging squint, the cause of the trouble is an abnormal dioptric arrangement, and the proper adjustment of lenses removes the cause and cures the defect.

Strabo, ab.64 B.C.–after 21. Greek geographer of Pontus. His work, pub. 1516, tr. 1854–57, is in 17 books, largely based



The Earth in the Time of Strabo.

on his own travels, and in parts of much value, but least concerning Greece proper. Of his history in 47 books, mainly a continuation of Polybius, only fragments remain.

Strabo, WALAHFRID, ab.809–849. Abbot of Reichenau 838; theologian and poet. His chief work, *Glossa*, a commentary, mainly extracted from the Fathers, pub. ab.1475, was long used and highly valued.

Strachan, JOHN, D.D., LL.D., 1778–1867. Bp. of Toronto 1839; active and influential.

Strachey, WILLIAM, b.ab.1585. Early writer on Bermuda and Virginia, 1612–18.

Strack, HERMANN LEBRECHT, D.D., b.1848. Prof. Berlin 1877; writer on O. T. *Hebrew Grammar*, 1883, tr. 1886.

Stradella, ALESSANDRO, ab.1645–1681. Italian singer and composer, hero of a romance which ended in his murder and has been told dramatically in an opera by Flotow; mistakenly credited with the church airs beginning *Pièta, Signore*, and *Se i miei sospiri*.

Stradivarius, ANTONIUS, 1644–1737. Greatest of all violin makers. He worked ab. 70 years in Cremona.—Two sons, FRANCESCO, 1671–1743, and OMOBONO, 1679–1742, were his assistants.

Strafford, THOMAS WENTWORTH, EARL OF, 1593–1641. M.P. 1614; moderate liberal till 1628, thenceforth royalist; made Baron and Viscount 1628, Privy Councilor 1629; Lord Deputy of Ireland 1633, where he ruled with great force and severity; Earl and Lord-lieut. 1640; impeached for subverting the public liberties, then attainted; beheaded, the king's consent having been extorted. As the ablest and most determined of Charles I.'s Ministers, he has been painted in dark colors by Macaulay. His policy of "Thorough" was the main support of tyranny, and he and Abp. Laud fell with it.

Stragglers. Soldiers who lag behind on the march or who seek the rear during a battle.

Straight Angle. That formed by two lines in exactly opposite directions; equal to 180 degrees.

Straight Line. In Elementary Mathematics, shortest distance between two points. In Analytical Geometry, path traced by a point moving continuously in one direction. It is indefinite in extent, unless limited by arbitrary points or given conditions. It can always be represented by an equation of the first degree between two variables, and every equation of the first degree represents a straight line.

Straight Line Gales. See DERECHO.

Straight University. At New Orleans, La.; chartered 1869 by American Missionary Association for the education of negroes. Both sexes admitted; instruction is given in academic, normal, collegiate, and theological departments, with manual training throughout the course. In 1897 there were 22 teachers and 579 students.

Strain, ISAAC G., U.S.N., 1821–1857. Lieut. 1850. As head of an expedition, 1854, to survey the Isthmus of Darien, he endured great perils and privations, and won much repute.

Strain. In Engineering, force or stress brought upon a bar, or elongation or compression of the bar caused by the stress; generally the latter in England, the former in the U. S. See FORCE.

Strain Ellipsoid. Result when any three mutually rectangular axes of an imaginary sphere, taken anywhere within a body before stress is applied, are found, after the body has been strained, to be changed in length in the ratios $1:\alpha$, $1:\beta$, $1:\gamma$ respectively.

Straining Beam. Horizontal beam connecting the tops of the struts of a queen-post truss, and acting as a compression member.

Strains on Guns. Stresses, arising from the explosion of the charge, produce deformations called the radial, tangential and longitudinal strains. In modern gun construction these are reduced by the method of initial compression; that is, by shrinking one or more jackets on the interior tube in building up a gun. The computation of the proper stresses each tube ought to bear, the thickness of each jacket and the radial dimensions at each point of the gun are problems in practical mechanics which have so far been satisfactorily deduced from the theory employed in gun construction.

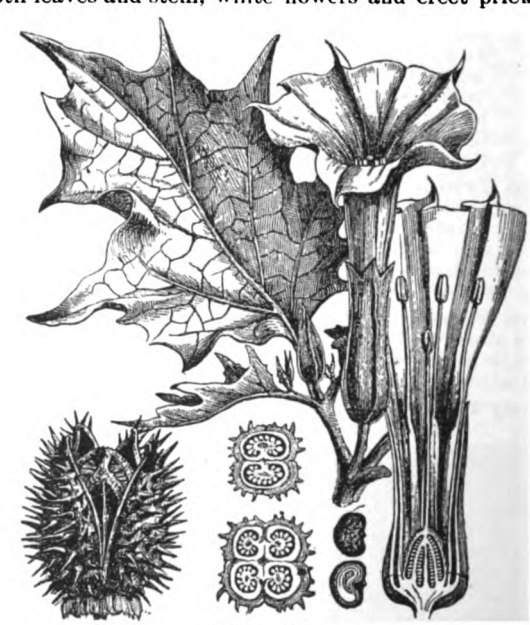
Straits Settlements. British colony, including Singapore, Malacca, and other small islands, with part of the Malay peninsula; formed 1853, separated from India 1867, and since enlarged. Area 1,542 sq. m.; pop., 1891, 512,000, mostly Malays and Chinese. Connected with these are several protected Malay States, in area 34,610 sq. m.; pop., 1891, 412,440.

Strakosch, MAURICE, 1825–1887. Austrian pianist and composer, operatic manager in U. S. from 1855.—His brother, MAX, b.1835, was his associate.

Stralsund. Town of Pomerania, on the Baltic, near Rugen Is.; founded 1209; besieged 1628 by Wallenstein, who lost near half his army; held by Sweden 1628–1715, by the French 1807–9, by Denmark 1809 and 1814–15, and since by Prussia. Pop., 1890, 27,820.

Stramineous. Straw-colored organs or organisms.

Stramonium. *Datura stramonium.* Annual plant with smooth leaves and stem, white flowers and erect prickly cap-



Stramonium.

sules. It is a native of the E. Indies, and is one of the most powerful narcotic acrid poisons; rarely used in medicine. See DATURA and JAMESTOWN WEED.

Strandberg, KARL VILHELM AUGUST, 1818–1877. Swedish lyric poet and translator.

Strange, SIR ROBERT, 1721–1792. Engraver, b. in the Orkney Islands; in London from 1750; knighted 1787; member of the Academies of Rome, Florence, Bologna, Parma, and Paris.

Strange, ROBERT, LL.D., 1796–1854. Judge N. C. Superior Court 1826–36; U. S. Senator 1837–40.

Strangford, PERCY CLINTON SIDNEY SMYTHE, 6TH (Irish) VISCOUNT, 1780–1855. Envoy to Turkey and Russia; Baron Penshurst 1825. Tr. Camoens' *Rimas*, 1803.—His son, PERCY FREDERICK WILLIAM, 1825–1869, 8th Viscount 1857, was a noted Orientalist. *Writings*, 1869; *Letters and Papers*, 1878.

Strangles. Inflammation of the upper air passages of the horse. The nasal cavity is most likely to be affected, and is

associated suppuration of the lymphatic glands. The disease is communicable.

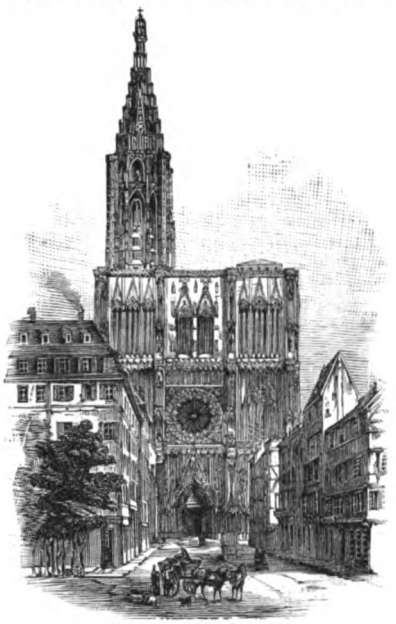
Strangle Weed. See ROOT PARASITES.

Strangury. Symptom of certain inflammatory conditions of the bladder or prostate gland, or of the poisoning by turpentine or cantharides, where the urine is voided drop by drop accompanied by pain.

Strapazola, GIOVAN FRANCESCO, ab.1490–ab.1560. Italian author and compiler of novelle or tales in the *Decameron* manner. His *Tredeci piacevoli notti*, 1550–54, was tr. into French 1560–73 and reprinted 1882.

Strap-Shaped. Ray flowers in many plants of the Composite family.

Strasburg. Capital of Alsace-Lorraine; on the Ill, 2 m. w. of the Rhine; ancient Roman colony; scene of Julian's victory over the Allemanni 357; seized by Louis XIV. 1681; fortified by Vauban 1682–84; surrendered to the German forces Sept. 1870 after a siege of 7 weeks. It has a large trade,



Strasburg Cathedral.

varied manufactures, a famous cathedral, rebuilt 1015–1439, with an astronomical clock partly made 1571, and a university, founded 1621, suspended 1793, reorganized 1872, with over 100 teachers, 980 students (1895), and a library of 600,000 vols. Pop., 1890, 123,566.

Strass. Glass of high refractive index, used for making artificial gems. It is a lead-glass, containing a large percentage of lead.

Strassburg, GOTTFRIED VON, 12th cent. German epic poet, author of one version of *Tristan and Isolde*.

Stratagem. Any military maneuver or disposition of troops undertaken to deceive the enemy, which, by its successful application, promises to yield a military advantage.

Strategy. That branch of the art of war by means of which a general may decide upon the best time, place and character of a battle, that will confer the greatest benefit or result in the least injury.

Stratford. Town of Essex, on the Lea, 4 m. e.n.e. of London. Pop., 1891, 42,982; of Stratford-le-Bow, or Bow, opposite, 40,378.

Stratford de Redcliffe, STRATFORD CANNING, VISCOUNT, 1786–1880. Minister to Turkey 1810; negotiator of the treaty of Bucharest 1812; Envoy to Switzerland 1814–19, and to U. S. 1820–23; M.P. 1828–41; Ambassador to Turkey 1825–28 and 1842–58, where he was trusted by the Sultan, and gained a diplomatic victory over Russia 1853.

Stratford-on-Avon. In Warwickshire, 110 m. n.w. of London; famous as Shakespeare's birthplace and residence. Pop., 1891, 8,318.

Strathclyde. Kingdom of s.w. Scotland ab.750–1124.

Strathmore. Plain in Kincardineshire, ab.100 m. long by 5 to 10 wide. It includes Perth.

Strathnairn, HUGH HENRY ROSE, LORD, 1803–1885. Commander in Central India 1857–58; prominent in repressing the Sepoy mutiny; Lieut.-gen. 1860; Commander-in-chief in India 1863, and in Ireland 1865–70; Baron 1866; Field-marshal 1877.

Strathspey. Scottish popular dance, resembling the reel, but slower and less regular; known since ab.1750.

Stratification. Arrangement of rock material in successive layers; generally the result of sedimentation.

Stratton, CHARLES SHERWOOD ("TOM THUMB"), 1838–1883. American dwarf, exhibited by P. T. Barnum from 1842; in Europe 1844 and 1857. He was 2 ft. high and weighed 16 lbs.; in 1863 he was 31 in. in height and later 40 in., weighing 70 lbs. —His wife, MERCY LAVINIA (BUMP), b.1841, m.1863, was 32 in. in height; her stage name was Livinia Warren. She increased to 40 in. and 50 lbs. weight. She married Perimo Magri, an Italian dwarf, 1885.

Stratton Hill. In Cornwall; scene of a royalist victory, May 13, 1643, over the parliamentary forces under Stamford, who lost 2,000 men, his ordnance and baggage train.

Stratum. Single bed of rock.

Stratus. See CLOUDS.

Straus, OSCAR SOLOMON, b.1850 in Bavaria. U. S. Minister to Turkey 1887–89.

Strauss, DAVID FRIEDRICH, 1808–1874. German rationalist. His *Life of Jesus*, 1835–36, tr. by George Eliot 1846, urged the mythical theory, and roused a storm of opposition. His

David Friedrich Strauss.

Christliche Glaubenslehre, 1840–41, a history of doctrine, received much less attention. *Ulrich von Hutten*, 1857, tr. 1874; *New Life of Jesus*, 1864, tr. 1865; *Voltaire*, 1870; *The Old Faith and the New*, 1872, tr. 1873. *Works*, 12 vols., 1876–78.

Strauss, JOHANN, b.1825 in Vienna. Composer of dance music, popularly termed "the Waltz King." The best known of his waltzes, *On the Beautiful Blue Danube*, was written for men's voices. He is equally successful as a composer of operettas: *Indigo*, 1871; *Carnival in Rome*, 1873; *The Bat*, 1874; *Cagliostro*, 1875; *Prince Methusalem*, 1877; *Blind Man's Buff*, 1878; *Queen's Lace Handkerchief*, 1880; *Merry War*, 1881; *A Night in Venice*, 1883; *Gypsy Baron*, 1885; *Simplicius*, 1887; *Ritter Pasman*, 1892; *Goddess of Reason*, 1897.—His brother, EDWARD, b.1835, composer of dances and conductor of Austrian court balls, made a tour in the U. S. with his orchestra 1890.—Their brother, JOSEF, 1827–1870, and their father, JOHANN, 1804–1849, were also composers of dances.

Strauss, RICHARD, b.1864 in Munich. Extremist in the tendency encouraged by Berlioz, Wagner, and Liszt, Court Chapelmaster at Munich since 1895. Lyric drama: *Guntram;* Symphonic poems: *Aus Italien, Don Juan, Tod und Verklärung, Till Eulenspiegel, Also sprach Zarathustra.*

Straw. Ripened and dried stalks of the cereal grains after the seeds have been removed. It takes the name of the grain which grew upon it, as oat straw, wheat straw, etc. Most straws are of small value as fodder, but are of value as absorbents for the liquid part of animal excrements and for adding a large amount of easily decaying vegetable matter to the soil, with some mineral fertilizing materials.

Straw. The stalks of wheat, rye, oats and barley have been wrought into a variety of articles from ancient times and by many races of people; such as hats, mats, baskets, shoes, bonnets, hammocks and furniture. Large quantities are used

in paper making, rye-straw being best suited for this purpose. For making hats and bonnets wheat-straw is used, sometimes whole, as with the Leghorn plaits, but generally split. It is spread upon the grass to bleach and is then plaited. Straw plait is imported into the U. S., for the manufacture of hats and bonnets, from England, Italy, France, Switzerland, Belgium, Germany, China and Japan. See PAPER.

Strawberry. Herbs of the genus *Fragaria*, natural family *Rosaceæ*, bearing white flowers and edible fruits. The species are of wide distribution and universally cultivated.

Strawberry (leaf, flower, fruit).

Strawberry Hill. See TWICKENHAM.

Strawberry Shrub. *Butneria.* Genus of purple-flowered shrubs of the s. Alleganies, much planted for their fragrant flowers.

Strawberry Tomato. *Physalis alkekengi.* Yellow-flowered herb of the natural family *Solanaceæ*, native of Europe, cultivated for its esculent red fruit; introduced as a weed into America.

Strawboard. Thick paperboard made principally of wheat or rye straw, after boiling in lime or soda to soften it; used in making boxes.

Streak. In Mineralogy, color of the powder of a mineral; so called because it can usually be obtained by making a mark with the mineral on a hard rough surface, like that of unglazed porcelain.

Stream Tin. See TIN, METALLURGY OF.

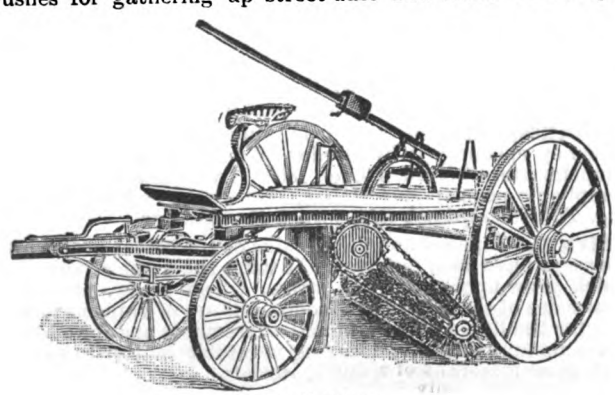
Streator. City of La Salle co., Ill., on the Vermilion, 94 m. s.w. of Chicago; founded 1868, chartered 1882. Its industries deal chiefly with coal, clay, and glass. Pop., 1890, 11,414.

Street, ALFRED BILLINGS, 1811–1881. Poet; State Librarian of N. Y. from 1848.

Street, GEORGE EDMUND, 1824–1881. English architect, R.A. 1871; builder or restorer of many churches, mostly Gothic; designer of the London law-courts 1868. *Architecture of N. Italy in Middle Ages*, 1855; *Gothic Architecture in Spain*, 1865.

Street Railways. The first street railway was operated by horses in Fourth Avenue, New York, 1831–35, by John Stevenson, without commercial success. In 1845 cars, similar to those now in use, were introduced. In 1852 several of the long lines were commenced there, followed by Boston 1856, Philadelphia 1857, New Orleans 1861. In Paris a line was opened 1853, and in Birkenhead and London in 1860, the latter being soon suspended; the first permanent line was opened there 1870. The first cable line was operated in San Francisco 1873. Electricity was first used near Berlin 1881, and in Cleveland 1884. The first trolley car was run in Kansas City 1886. Compressed air was first applied at Nantes, France, 1881. The first underground railway was built in London 1863; it was operated by locomotives; an electric underground road was opened there 1890. In Berlin an elevated railroad was operated 1882. In New York an elevated cable road was opened 1869, without success; in 1871 locomotives were used upon one successfully. See ELECTRIC RAILWAYS.

Street Sweeper. Wagon provided with scrapers and brushes for gathering up street-dust and mud. A sweeper



Street Sweeper.

with five rows of brushes was used in England in 1831. The cut shows one form drawn by two horses, the revolving broom being set obliquely, so that the refuse may be carried to one side of the street.

Streitberg, WILHELM, b.1864. Prof. Freiburg 1889; philological writer.

Streltzi. Russian militia guard, originated by Ivan the Terrible. It became unruly and turbulent, was decimated 1698, and nearly exterminated 1705 by Peter the Great.

Strength of Materials. Resistance of materials to rupture under forces of tension, compression, and shear, as also under flexure and torsion. It is properly concerned with the phenomena of ultimate strength rather than with those of elasticity. Galileo in 1638 experimented on the flexure of beams, but little precise knowledge was obtained until near 1800, and even now many things are not well understood (see RESISTANCE OF MATERIALS). The following table gives the mean values, in lbs. per sq. in., of the ultimate strengths of the principal materials:

Material.	Tensile Strength.	Compressive Strength.	Shearing Strength.
Timber	10,000	8,000	3,000
Brick	500	3,000	1,000
Stone		5,000	2,000
Cast Iron	20,000	90,000	25,000
Wrought Iron	50,000	50,000	45,000
Steel	100,000	150,000	75,000

Strepsiptera. Order of *Insecta* having rudimentary anterior wings and large posterior wings that can be folded longitudinally. The mouth parts are rudimentary. The females have no wings, legs, nor eyes, and resemble maggots. The larvæ are parasitic in the abdomen of wasps, etc., in which hosts they pass through the pupa-stage. *Stylops* is an example. The group is perhaps to be considered as a degenerated sub-order of *Coleoptera*.

Strepsirhine. See PROSIMII.

Streptococcus. See COCCUS BACTERIA.

Streptoneura. Division of Gastropods, including the Heteropods and Prosobranchs; they are also grouped as *Azygobranchia* and *Patella* (*Zygobranchia*). In these forms the visceral nerves may be conceived as united above the originally straight intestine, and when, during development, the latter is twisted, the nerve cords also suffer a twist into a figure 8 shape. See ANISONEURA and ISOPLEURA.

Streptostylica. *Lepidosauria*, referring to the loose articulation of quadrate bone to the postorbital bar when present.

Stress. In Engineering, tensile or compressive force acting upon a bar; in general, any internal resisting force which equilibriates an applied load. Stresses are measured in lbs. per sq. inch. See FORCE, COMPRESSIVE STRENGTH, and STRENGTH OF MATERIALS.

Stretcher. Light, but strong frame, covered with stout canvas and used to carry the sick or wounded to the hospital.

Stretcher. Stone whose longest dimension is parallel to the face of a wall. See HEADER.

Stretton, HESBA. See SMITH, HANNAH.

Striated. Streaked or marked with fine thread-like lines.

Stribling, CORNELIUS KINCHILOE, U.S.N., 1796–1880. Captain 1853, Commodore 1862, Rear-admiral 1866.

Strickland, AGNES, 1806–1874. English author, pensioned 1870. Her popular *Lives of the Queens of England*, 12 vols., 1840–48, and *of Scotland*, 8 vols., 1850–59, were in part the work of her sister ELIZABETH, 1794–1875. A brother, SAMUEL, 1809–1867, pub. *27 Years in Canada West*, 1853.

Strickland, WILLIAM, 1787–1854. American architect.

Strickland, WILLIAM PETER, D.D., 1809–1884. American writer on Methodism.

Strict. In Botany, upright organs, especially erect stems and branches.

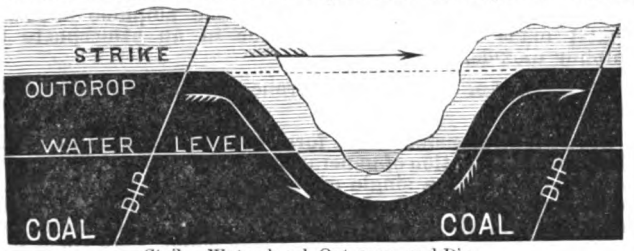
Stricture. In Surgery, the narrowing of a tube-like organ, preventing or making difficult the performance of its function. Thus a stricture of the œsophagus interferes with swallowing. Strictures may be produced by accident (as frequently seen in the accidental swallowing of an irritating substance, such as carbolic acid, producing inflammation), by disease in the structure of the organ itself, or by the pressure of some growth on the outside of the organ.

Stridulantia. See HOMOPTERA.

Striges. See STRIGIDÆ.

Strigidæ. Family of Raptatorial birds, including the OWLS (q.v.).

Strike. In stratified rock, or in mineral veins, the direction of a horizontal line in the plane of the deposit. It is at



Strike, Water-level, Out-crop, and Dip.

right angles to the dip. It is nearly synonymous with course and BEARING (q.v.). See OUT-CROP and DIP.

Strike. Concerted refusal, on the part of all or many employees in any establishment, to work except under certain conditions of wages, hours, or other circumstances.

Strikes and Lockouts. A strike is the refusal of employés to work unless the employer accedes to some demand. A lockout is the refusal of the management to allow the employés to work except under some dictated condition. A boycott is preventing the sale of the goods of an employer by the employés. From 1881 to June 30, 1894, there were in the U. S. 14,390 strikes, affecting 69,167 establishments, throwing out of employment 3,614,406 employés; the percentage of establishments where strikes were successful was 44.49. The loss of wages to employés from strikes was $163,807,866, from lockouts $26,685,516; the business loss to employers from strikes was $82,590,386, from lockouts $12,235,451. See ARBITRATION, ARBITRATION BOARD, BOYCOTTING, COMBINATION LAWS, COMBINATION OF LABOR, LOCKOUTS, STRIKE, and TRADES UNIONS.

Striking a Center. Process of removing the timber false works upon which a stone arch has been erected.

Striking Distance. Maximum distance between two points across which, with a given difference of potential, an electric spark will pass. In a gas, it depends upon the nature of the gas and upon its pressure. It also depends upon the difference of potential, but is not in simple proportional to it, the curve indicating the ratio of striking distances to differences of potential being a parabola.

Strindberg, AUGUST, b.1849. Swedish dramatist, novelist and satirist. His *New Kingdom*, 1882, led to his virtual exile, and *Married Life*, 1884, to a trial for blasphemy. *Utopias*, 1885; *Tschandala*, 1889.

Stringcourse. In a building a projecting, horizontal line of molding; exteriorly it is carried over windows and across buttresses.

Stringer. Beam connecting or resting upon the cross floor beams and serving to support the roadway of a bridge; sometimes made of timber, but usually of wrought iron.

Stringhalt. Variety of chorea in the horse. It consists of a sudden picking up of one or both hind legs.

Stringham, SILAS HORTON, U.S.N., 1798–1876. Captain 1841; active at Vera Cruz, 1847, and Hatteras; Commodore 1861, Rear-admiral 1862.

Strobila. Stage in the development of discophorous Jelly-fishes in which the larva (scyphistoma) fixes itself and, after a period of budding, becomes transversely segmented into disks, which are successively set free as ephyræ or young medusæ.

Strobilaceous. In Botany, structures resembling or pertaining to cones.

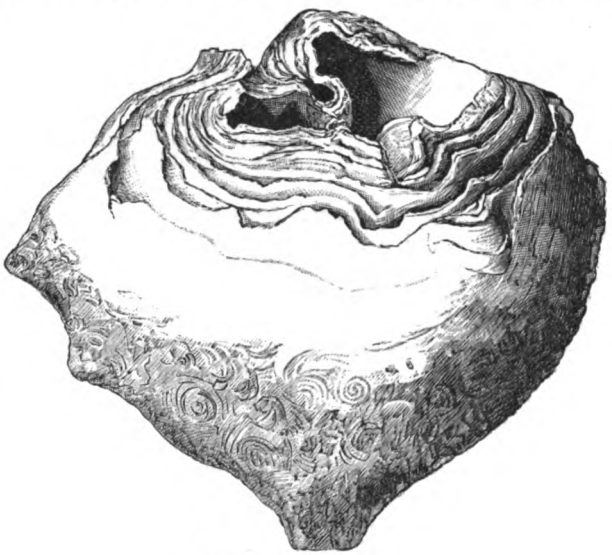
Strobilation. Formation of metameres that are successively set free as independent zoöids, as in the strobila of discophorous Jelly-fishes, the Tapeworm, etc.

Strobile. See CONE.

Stroboscopic Disk. Device of Stampfer, consisting of a disk of card or metal, capable of rotating, around the edge of which is a row of equidistant narrow apertures. If a stream of water at a short distance from the opening through which it issues be viewed through the apertures as the disk rotates, through each opening a glimpse is caught of the jet in a certain position. If the rate of rotation of the disk be properly adjusted, each successive glimpse is caught just when each falling drop into which the stream breaks up has taken the place of its predecessor; thus a stationary drop seems to be suspended in the air. About the same time, 1833, Plateau devised a similar toy, called the Phenakistoscope. More recently another arrangement for showing the same illusion has been devised. See THAUMATROPE and ZOETROPE.

Stroma. Ground substance containing other objects; especially, form of the mycelium of certain *Fungi*, which, instead of remaining fibrous, has the hyphæ matted together into a dense structure.

Stromatoporidæ. Group of fossil *Hydrozoa*, abundant in the Palæozoic Period. The general appearance of some of them is similar to a wasp's nest, being sub-globular, composed of concentric lamellæ of calcareous substance, and at-



Stromatopora Rugosa.

tached by a stalk. The horizontal or concentric laminæ are connected by radiating or vertical fibers, and the whole forms a series of tubes, crossed by transverse partitions, at the outer end of which the zoöids lived. Some approach the *Millepores*, others the *Hydractinia*, in general structure.

Strombus. Leguminous pod which is spirally twisted.

Stromeyerite. Ag_2S,Cu_2S. Mineral compound of silver, copper, and sulphur, sometimes found, though not abundantly, associated with chalcopyrite.

Strong, AUGUSTUS HOPKINS, D.D., LL.D., b.1836. Pres. Rochester Theol. Sem. since 1872. *Systematic Theology*, 1886.

Strong, CALEB, 1745–1819. U. S. Senator 1789–96; Gov. of Mass. 1800–7 and 1812–16. He refused to furnish troops for the war with England, and used home resources for State defense.

Strong, GEORGE CROCKETT, U.S.A., 1832–1863. Active in La. 1861–62; Brig.-gen. U. S. Vols. 1862, Major-gen. 1863; mortally wounded in assaulting Fort Wagner, S. C.

Strong, GEORGE TEMPLETON, b.1856. American composer of pianoforte pieces, part-songs for men, symphonic poem *Undine*, symphonies, *In the Mountains* and *Sintram;* living in Europe.

Strong, JAMES, D.D., LL.D., 1822–1894. Prof. in Drew Seminary from 1868. *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature* (partly with Dr. John McClintock), 10 vols., 1867–81; Supplement to the same, 2 vols., 1885–87; *Exhaustive Concordance*, 1894.

Strong, JAMES HOOKER, U.S.N., 1814–1882. Commander 1861, serving on the Atlantic and Gulf coasts; Captain 1865, Commodore 1870, Rear-admiral 1873.

Strong, JOSIAH, D.D., b.1847. American author. *Our Country*, 1886; *New Era*, 1893.

Strong, MOSES, d.1877. Geologist, author of a report on the Wis. lead region.

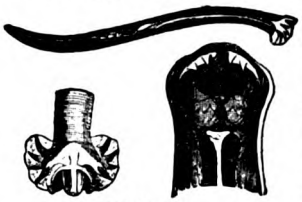
Strong, THEODORE, LL.D., 1790–1869. Prof. of Mathematics at Yale 1816–27, and Rutgers 1827–61. *Algebra*, 1859; *Calculus*, 1869.

Strong, WILLIAM, LL.D., 1808–1895. M.C. 1847–51; Justice Pa. Supreme Court 1857–68, and U. S. Supreme Court 1870–80; member Electoral Commission 1877.—His cousin, THERON JUDD, 1802–1873, was M.C. 1839–41, and Judge N. Y. Supreme Court 1852–60.

Strongbow, RICHARD DE CLARE, 2D EARL OF PEMBROKE, d.1176; in Ireland from 1170; Gov. 1173.

Strongyle. Strongylate rhabdus; *i.e.*, one rounded at the ends; form of sponge spicule.

Strongylidæ. Nematode worms, parasitic in the lungs and intestines; *e. g.*, *Dochmius.* They have usually six papillæ about a wide mouth, in the bottom of which, in some cases, are teeth. The male genital opening is at the end of the body, surrounded by an umbrella-shaped disk. Colic in horses, and the disease called Egyptian chlorosis, are due to their presence.



Dochmius

Strontianite. $SrCO_3$. Mineral strontium carbonate, formerly mined extensively in Westphalia for use in the process of making and purifying beet-sugar.

Strontium. Sr. Element. At. wt. 87.6, sp. gr. 2.5, mpt. 600° C., valence II.; discovered by Davy 1808. It occurs in nature as celestite, STRONTIANITE (q.v.), and is isolated by electrolysis of the molten chloride. It has a metallic luster and a brass-yellow color, oxidizes readily, and decomposes water rapidly. It is soluble in the common acids.

Strontium Bromate. $Sr(BrO_3)_2+H_2O$. Small, lustrous, prismatic crystals, isomorphous with barium chlorate; made by treating the hydroxide with bromine.

Strontium Bromide. $SrBr_2+6H_2O$. Crystals which melt in their water of crystallization; efflorescent; made by dissolving the hydroxide or carbonate in hydrobromic acid.

Strontium Carbide. SrC_2. Strontium acetylide; black substance, having a gold streak; made by heating the oxide with finely divided carbon. With water and acids it yields acetylene.

Strontium Carbonate. $SrCO_3$. Found in nature as STRONTIANITE (q.v.); white powder, obtained by treating the chloride in solution with ammonium carbonate solution; soluble with difficulty in water.

Strontium Chlorate. $Sr(ClO_3)_2$. Deliquescent, rhombic, pyramidal crystals; mpt. 290° C. with decomposition; made by passing chlorine into a boiling solution of the hydroxide; soluble in water.

Strontium Chloride. $SrCl_2$. White, soluble, crystalline salt, made by treating strontium carbonate with hydrochloric acid.

Strontium Cyanide. $Sr(CN)_2$. Obtained from strontium ferrocyanide on heating. It decomposes in the air.

Strontium Fluoride. SrF_2. White powder or regular octahedra, obtained by boiling the hydroxide or carbonate with hydrofluoric acid.

Strontium Hydroxide. $Sr(OH)_2$. Found as an amorphous powder and in tetragonal transparent crystals, containing 9 molecules of water; made by burning strontianite and treating with water. It has an alkaline reaction.

Strontium Iodate. $Sr(IO_3)_2.+H_2O$. Made by the action of iodine on a solution of the hydroxide. From cold water it crystallizes with 6 molecules of water.

Strontium Iodide. SrI_2+6H_2O. Six-sided tablets, made by treating a mixture of the sulphite and hydroxide with iodine.

Strontium Nitrate. $Sr(NO_3)_2$. White, soluble, crystallized salt, made by treating the carbonate with nitric acid; used in considerable quantities for preparing mixtures which when burned give a red light, as Bengal fire and red fire.

Strontium Nitrite. $Sr(NO_2)_2$. Anhydrous, hygroscopic needles, soluble in water and alcohol; made by heating the nitrate.

Strontium Oxide. SrO. White powder, resembling lime; made by heating strontium nitrate.

Strontium Phosphate. $Sr_3(PO_4)_2$. White precipitate, obtained by adding sodium hydrogen phosphate to an ammoniacal solution of strontium chloride; insoluble in water.

Strontium Sulphate. $SrSO_4$. Found in nature as CELESTITE (q.v.); obtained as a white powder by treating a soluble strontium salt with a soluble sulphate; soluble with difficulty.

Strontium Sulphide. SrS. White, phosphorescent powder, obtained by heating the sulphate with carbon; decomposed by water.

Strontium Sulphite. $SrSO_3$. White, crystalline kernels, or flat right-angled tablets. On heating, it gives a yellowish-green fluorescent mixture of the sulphide and sulphate; made by heating the oxide in an atmosphere of sulphur dioxide.

Strophiole. Small protuberance at the hilum of a seed; caruncle.

Strophogenesis. That form of Amphigenesis in which there is no alternation of generations, but a series of non-sexual buds, constituting a single generation, one or more of which reproduces the individual, as in the higher animals. In the higher plants there is apparently the same condition, but really a hidden sporophore generation which puts them into the category of hypogenesis. If a similar condition could be proven true of vertebrates, etc., strophogenesis and hypogenesis would be the same.

Strophoids. Class of curves generated by the intersections of two straight lines rotating uniformly about two points in space. The logocyclic curve is a form of the strophoid: other curves are found to be strophoids under particular conditions.

Strother, DAVID HUNTER ("PORTE-CRAYON"), 1816–1888. Va. author and illustrator; officer U. S. Vols. 1861–64; Consul-gen. to Mexico 1879–85. *Blackwater Chronicle*, 1853; *Va. Illustrated*, 1857.

Stroud, GEORGE MCDOWELL, 1795–1875. Pa. Judge. *Laws Relative to Slavery*, 1827–56.

Structural Botany. Science of the form and relations of the parts of plants, considered either anatomically or histologically.

Struensee, JOHANN FRIEDRICH, COUNT, 1737–1772. Physician to Christian VII. of Denmark 1768; paramour of Queen

Johann Friedrich Struensee.

Caroline Matilda (1751–1775), sister of George III. of England; Minister of State, and radical reformer; accused of sundry political offenses, and executed.

Struggle for Existence. See NATURAL SELECTION.

Struma. Abnormal tendency or condition of the body allied to scrofula or consumption (tubercle). Some writers make a distinction between scrofula and tubercle, when struma is used to include both conditions. Others consider them to be but different manifestations of the same disease, when struma becomes synonymous.

Strumose. Having an unsymmetrical swelling of one of several homologous parts, as of the tissues of one side of a moss-capsule.

Strümpell, GUSTAV ADOLF, b.1853 in Russia. Prof. Leipzig 1882, Erlangen 1886. *Pathologie und Therapie*, 1883.

Strut. Bar acting as a column, or post subject to compressive stress.

Struthiin. See SAPONIN.

Struthiones. See CURSORES (*Ratidæ*), and OSTRICH.

Strutt, JOHN W. See RAYLEIGH.

Strutt, JOSEPH. 1742–1802. English antiquarian. *Regal and Ecclesiastical Antiquities*, 1773; *Horda-Angel Cynnan*, 1774–76; *Chronicle* (to 1066), 1777–78; *Biog. Dict. of Engravers*, 1785–86; *Dress and Habits*, 1796–99; *Sports and Pastimes*, 1801.

Struve, FRIEDRICH GEORG WILHELM VON, 1793–1864. Prof. of Astronomy and Mathematics at Dorpat, Russia, 1813; appointed 1835 to superintend the erection of the great Russian observatory at Pulkowa, completed 1839, and its director till 1861, as was his son, OTTO WILHELM, b.1819, till 1890.

Struve, GUSTAV VON, 1805–1870. Bavarian radical, in America 1851–63; prolific writer.

Struvite. Natural hydrous ammonium magnesium phosphate, found as a mineral in some guano deposits.

Strychnine. $C_{21}H_{22}N_2O_2$. Exceedingly poisonous base or alkaloid, found in the seeds of *Strychnos nux-vomica;* rhombic crystals; mpt. 268° C.; it is intensely bitter to the taste. Spinal poison. ¼ of a grain having produced death. It is probably a derivative of quinoline. It is a valuable medicine, as a general tonic, as a nerve tonic in cases of nerve exhaustion apart from inflammatory conditions, and as a heart tonic. Chloroform and tannic acid have been given internally as antidotes. See NUX VOMICA.

Stryker, MELANCTHON WOOLSEY, D.D., b.1851. Pres. Hamilton Coll. 1892; compiler of hymn and tune books.

Strype, JOHN, 1643–1737. English author or compiler of sundry biographies, of *Annals of the Reformation*, 4 vols., 1709–31, and of *Ecclesiastical Memorials*, 3 vols., 1721. *Works*, 27 vols., 1821–43.

Stuart. See STEWART.

Stuart, ARABELLA, 1575–1615. Daughter of the Earl of Lenox, niece of Darnley, and cousin of James I.; pretender to the English throne 1603; married to Wm. Seymour 1610. She died in the Tower.

Stuart, GILBERT, 1755–1828. American painter, in Boston from 1805. He produced many portraits of Washington and other public men.

Stuart, HENRY BENEDICT MARIA CLEMENT, 1725–1807. Grandson of James II.; brother of Charles Edward; Cardinal York 1747; last of the Pretenders.

Stuart, JAMES. See MURRAY, EARL OF.

Stuart, JAMES, 1713–1788. English architect. *Antiquities of Athens*, 1762–94; *Buildings of London*, 1771.

Stuart, JAMES, 1776–1849. Scottish author and journalist. *Three Years in N. America*, 1833.

Stuart, JAMES EWELL BROWN, 1833–1864. Brig.-gen. C.S.A. 1861, Major-gen. 1862; active and prominent as a cavalry commander in Va.; captor of Chambersburg, Pa., Oct. 10, 1862; famous for his raids; killed near Richmond.—His father, ALEXANDER HUGH HOLMES, 1807–1891, was M.C. 1841–43, U. S. Sec. Interior 1850–53, and rector Univ. Va. 1876–82 and 1884–86.

Stuart, JAMES FRANCIS EDWARD, 1688–1766. Son of James II. and Mary of Modena; from 1701 regarded as king of England by France and the Jacobites. He led the rising of 1715: that of 1745, checked at Culloden, was headed by his son, CHARLES EDWARD, "the Young Pretender," 1720–1788.

Stuart, JOHN, LL.D., 1813–1877. Scottish antiquarian. *Sculptured Stones*, 1856–67.

Stuart, MOSES, 1780–1852. Prof. Andover 1810–48: pioneer of Biblical scholarship in America. *Hebrew Chrestomathy*, 1829; commentaries, 1827–52.

Stuart, ROBERT, 1785–1848. Scottish pioneer in Oregon, whence he journeyed to St. Louis 1812–13; celebrated in Irving's *Astoria*.

Stuart, ROBERT LEIGHTON, 1806–1882. New York merchant, noted, with his brother ALEXANDER, 1810–1879, for benefactions.

Stub, AMBROSIUS, 1705–1758. Danish lyric poet.

Stubbes, PHILIP. English puritan satirist. His *Anatomie of Abuses*, 1583, was repub. 1836 and 1879–82.—His relative, JOHN, ab.1541–ab.1600, lost his right hand for a supposedly seditious publication 1579.

Stubbs, WILLIAM, D.D., LL.D., b.1825. Prof. Oxford 1866; Bp. of Chester 1884, and of Oxford 1889. His *Constitutional History of England*, 1874–78, is of high value. *Early Plantagenets*, 1876.

Stub-Ends. Construction used for ends of connecting rods, or other rods which fit upon pins where wear is likely to occur. The contact on the pin is effected by two brasses, which are bored out, cylindrical on the inside, to fit the pin, and meet on the prolongation of one of its diameters. The outside is planed rectangular to fit within a strap which draws the brasses to the squared end of the rod proper by means of a GIB and KEYS (q.v.). An open stub draws the brasses toward the middle of the rod, as they wear, by drawing the strap back on the rod, since the key passes through a slot in the solid: the closed stub has the strap made a part of the rod, either by forging it solid with it, or by bolting or keying it fast. Then the gib and key bear against the brass, and the rod is lengthened as wear takes place. Instead of the gib and key, a taper wedge may be tightened by a screw in a closed stub. For parallel rods of locomotives which must not change in length by wear, there may be two keys, one at each side of the brasses of one end, or one end may be open and one closed, so that the change of length is the difference in amount of wear at the two pins. Split taper bushings of a hard composition, like phosphor-bronze, are somewhat used, being closed upon the pin as they are drawn into taper sockets by a screw-ring on the small end. For light pin connections, such as valve rods, hardened steel pins carefully ground, fitting upon similar steel bushings carefully lapped, are used, in place of more easily worn materials. The brasses of large work are easily and cheaply refitted or renewed, and the brass wears and not the expensive crank-pin.

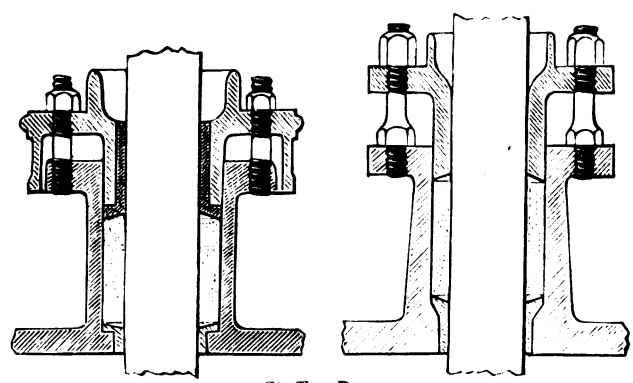
Stub Switch. One in which the two rails of the main track are moved so as to allow trains to pass upon a turnout or to keep upon the main track; oldest form of railroad switch, now used only on branch lines and turnouts.

Stucco. Mixture of plaster of Paris, slaked lime, gelatin and water, used for the finishing coat of interior walls of buildings. Moldings and ornaments are of similar materials, the latter being cast in molds.

Stud-Book. Book giving the pedigree of thoroughbred animals; particularly horses, cattle, and dogs.

Studdle. In Mining, piece of timber placed in the corner of a shaft as a part of the support for a set of shaft timbering; also auxiliary props set for other purposes.

Stuffing-Box. Device to allow a moving rod to pass out into a less pressure from a greater, without leakage around it or excessive friction as it moves. Where the rod protrudes, an annular space is left concentric with it, the bottom being inclined toward the hole, which the rod fits easily. Into this annular space fits the gland, which is a cylinder fitting the rod with a sliding fit, the inner bottom being tapered inward toward the rod, and the outer end either cast with a flat flange or plain. Where a flanged end is used, stud bolts passing through holes in the flange draw the gland into the annular



Stuffing-Box.

space, when nuts are tightened down on them; in the plain type, it is intended that the gland be drawn in by a cap, which fits over it and upon a screw-thread on the outside or inside of the box. Between the gland and the bottom of the box is to be put the PACKING (q.v.), so that the pressure from the conical gland bottom and box-bottom shall force the elastic material against the rod with desired pressure. For very large rods, the nuts on the studs are often small pinions which gear in common into one large gear concentric with the rod, so that all nuts are tightened equally and at once. For plungers the same structure is used, or else the CUP LEATHER (q.v.) packing.

Stukeley, WILLIAM, M.D., 1687–1765. English antiquarian.

Stull. In Mining, timber platform or support, on which the deads and rubbish that accumulate in a mine are piled.

Stump. In Mining, a small pillar of coal, with a passageway on each side, left standing where a breast or stall is opened off from a gangway.

Stumpf, CARL, b.1848. Prof. Prague 1879, Munich 1889, and Berlin 1894. *Tonpsychologie*, 1885–90.

Stundists. Russian dissenters; numerous and varying sects.

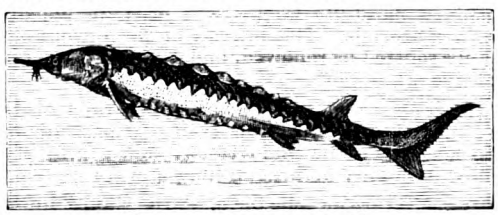
Stupor. Diminished activity of the intellectual faculties, often amounting to lethargy; it occurs in many affections, especially in neurosis. It is easy to wake a person from sleep, difficult in stupor and impossible in coma. The mind may be active in sleep, but is as if dead in stupor.

Sturdy. See GID.

Sture, SVEN, ab.1450–1503. Regent of Sweden, as were his relatives SVANTE NILSSON, d.1512, and SVEN, d.1520. All opposed the nominal supremacy of Denmark.

Sturge, JOSEPH, 1793–1859. English Quaker, active against slavery. *West Indies*, 1838; *Visit to U. S.*, 1842.

Sturgeon. The genus *Acipenser* includes seven species in the U. S. Some of these may attain a length of over 20 ft. and a weight of nearly a ton. The roe of the female is very abun-



Sturgeon (*Acipenser sturio*).

dant, and is salted and dried as caviare, after being washed in vinegar. The flesh is esteemed as food in some localities. The dried air bladders furnish isinglass. See CHONDROSTEI.

Sturges, JONATHAN, LL.D., 1740–1819. M.C. 1789–93; Judge Conn. Supreme Court 1793–1806.—His grandson, JONATHAN, 1802–1874, New York merchant, was prominent in public, railway, and charitable work.

Sturges, OCTAVIUS, M.D., 1833–1894. London physician. *Clinical Medicine*, 1873; *Pneumonia*, 1876; *Chorea*, 1881.

Sturgis, RUSSELL, b. 1836. American architect, writer on art and archæology. *European Architecture*, 1896.

Sturgis, SAMUEL DAVIS, U.S.A., 1822–1889. Brig.-gen. U.S. Vols. 1861–65, serving chiefly in the West.

Sturlason. See SNORRE.

Sturm, JACOB, 1771–1848. Engraver in Nürnberg. *Deutschlands Flora*, 1798–1855.

Sturm, JACQUES, 1743–1802. French botanist, long in S. America; explorer of the Orinoco and Amazon; writer on the flora of Brazil, 1798–1801.

Sturm, JACQUES CHARLES FRANÇOIS, 1803–1855. Swiss mathematician, Prof. of Mechanics at the Sorbonne, Paris, 1836; author of a theorem concerning the roots of an equation.

Sturm, JOHANNES, 1507–1589. Director of education in Strasburg from 1536. His ideas were carried out in a gymnasium and academy, founded 1538 and 1564, which became famous and influential throughout Europe.

Sturnidæ. See DENTIROSTRES.

Sturt, SIR CHARLES, ab. 1800–1869. Explorer of inland Australia 1828, 1830, and 1844; knighted 1868. *Two Expeditions*, 1833; *Narrative*, 1849.

Sturtevant, EDWARD LEWIS, M.D., b.1842. Director N. Y. Agricultural Experiment Station 1881–87; author of its first six reports. He has given particular attention to agricultural and economic botany.

Sturtevant, JULIAN MONSON, 1805–1886. Prof. Illinois Coll. from 1831, and its pres. 1844–76. *Economics*, 1876; *Autobiography*, 1897.

Sturzenbecker, OSKAR PATRICK, 1811–1869. Swedish author.

Stuttering. See STAMMERING.

Stuttgart. Capital of Würtemburg since 1482; on the Niesembach, near its junction with the Neckar. Its leading industry is printing and book-binding. It has an old castle and three 15th century churches, but most of its principal buildings are modern. The royal library has over 400,000 vols., including near 9,000 Bibles. Pop., 1890, 139,659.

Stuyvesant, PETER, 1602–1682. Last Dutch Gov. of N. Y., 1647–64; celebrated by Irving. He made peace with the In-

Peter Stuyvesant.

dians, and settled the boundaries between New Netherlands and the English colonies. In 1655 he retook the fort on the Delaware which the Swedes had captured 1654.

Stye. Circumscribed inflammation of the eyelid near the edge, usually including an eyelash in the inflamed area. It is attended by swelling, pain and the formation of pus. Like all diseases resembling boils, there is apt to be a series. Bathing the part with a hot solution of boric acid several times a day soothes. It is seldom necessary to open it. The scientific name is Hordeolum.

Style. In Botany, part of the pistil above the ovary upon which the stigma is borne.

Style, OLD AND NEW. See OLD STYLE.

Styles. Upright pieces of a door frame or other panelwork; the horizontal pieces are called Rails.

Stylidieæ, or CANDOLLEACEÆ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 5 genera and ab. 105 species, nearly all in Australia.

Stylites. Pillar-saints; ascetics of Syria, whose cells, open to the sky, were built on the tops of pillars. The most famous one, Simeon, 387–459, spent 30 years on one pillar.

Stylobate. Basement of a temple below the columns, resembling a continuous pedestal.

Stylogonidium. Spore with a stalk; called also pycnogonidium or stylospore.

Stylommatophora. Sub-group of the *Pulmonata*, including forms having eyes on the ends of retractile tentacles, behind the two ordinary tentacles. The group includes the Slugs (*Limax* and *Arion*), Land-snails (*Helix*, etc.), and *Amphipneusta* (*Onchidium*, etc.), which, having the lung behind the heart, are also called *Opisthopulmonata*. The group may also be divided into the *Monotremata* and *Ditremata*, the latter including *Onchidium*.

Stylonychia. One of the hypotrichous *Infusoria*. It has cilia, styles, and hooks on the ventral surface, used as locomotor appendages.

Stylopodium. Fleshy expansion of the bases of the styles in *Umbelliferæ*, in the form of a disk crowning the ovary.

Stylospores. Accessory propagating bodies borne by the mycelium of certain *Fungi*.

Stylus. Sponge spicule, of single axis, but growing only at one end, which is pointed. They occur in the genus *Polymastia*.

Stymphalian Birds. On Lake Stymphalus in Arcadia. They had claws, wings, and beaks of brass; used their feathers as arrows, ate the flesh of men, and were destroyed or expelled by Hercules.

Styphnic Acid. $C_6H(OH)_2(NO_2)_3$. Trinitroresorcin; yellow crystalline body, formed by the action of nitric acid on resorcin and on many resins. It closely resembles picric acid.

Styptics. Sometimes used synonymously with astringents, but generally applied to a substance used to arrest hæmorrhage. Tannic acid and persulphate of iron are styptics. See BLEEDERS and HÆMORRHAGE.

Styracaceæ. Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 7 genera and ab. 235 species, growing in the warmer regions of Asia, Australia and America; called the Storax family.

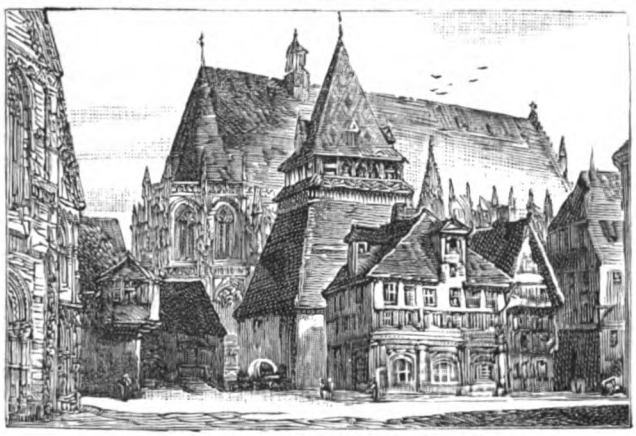
Styrene. $C_6H_5.CH:CH_2$. Phenylethylene; liquid hydrocarbon, boiling at 146° C. with a pleasant odor. It is present in storax and coal tar oil, and can be prepared from bromhydrocinnamic acid and soda. It unites with bromine.

Styria. Austrian province, w. of Hungary. Capital Gratz. Area 8,629 sq. m.; pop., 1890, 1,281,023.

Styrian Literature. See SLOVENIANS.

Styx. River in Arcadia; also a river feigned in mythology to flow around the lower regions. An oath of a deity by it was most sacredly binding.

Suabia, or SWABIA. Old duchy of s.w. Germany, n. and e. of the Rhine; held by the Hohenstaufens 1080–1268; important



St. John's Church, Swabasch Gmund.

in the Middle Ages; circle of the German Empire 1563–1806. During the reigns of the Hohenstaufens, this duchy was the richest, most powerful and civilized country of Germany.

Suabian League. Formed 1376 by sundry towns; headed later by the Duke of Würtemberg.

Suahili. Peoples of the Bantu group, occupying the Zanzibar coast of Africa. They have become mixed with Arabs, are Mohammedans, and great traders. Many tribes are included. Among the Bamjai the women command by right; the chief is chosen by freemen, the office not being hereditary. The Mashona are another tribe; they follow agriculture, and are skilled in iron work, making ornamented weapons. As traders they remind one of the Jews, whom they resemble in facial expression.

Suakim. Nubian port, on an island in Red Sea, lat. 19° 7′ N.; held by Britain since 1883; commercially important. Pop. ab. 11,000.

Suard, NICOLAS, ab.1740–1791. Haytian insurgent, executed by the French.

Suarez, FRANCISCO, 1548–1617. Spanish Jesuit, teacher of philosophy and theology at Rome and in Spanish universities. His *Defensio Fidei Catholicæ*, 1613, attacked James I. *De Statu Religionis*, tr. 1887. His works, as reprinted 1859, fill 29 vols.

Suarez, JOSÉ BERNARDO, b.1822. Chilian author.

Suarez y Romero, ANSELMO, 1818–1882. Cuban novelist and essayist. *Francisco*, 1860.

Suavolent. Plant or flower of pleasant odor.

Subahdar. Native captain in Indian army.

Subaltern. Commissioned officer of the army below the rank of captain; a first or a second lieutenant.

Subcarboniferous. Group of strata between the Devonian and the coal-measures.

Subcaulescent. Plant having a very short leafy stem.

Subclass. Group of orders, inferior in rank to a class.

Subcontrary Lines. When two straight lines make equal angles with other two straight lines not parallel, the pairs are mutually subcontraries. Chords of a circle, joining the points where two secants not parallel cut the circle, are subcontrary to the secants.

Subcontrary Sections. Plane sections of surfaces of the second order, similar though not parallel.

Subcortical Crypts (OF SPONGES). See SUBDERMAL CHAMBERS.

Subdeacon. In the R. C. hierarchy, lowest of the four major and highest of the five non-sacramental orders.

Subdermal Chambers (OF SPONGES). Cavities hollowed out in the cortex, and covered by a cribriform roof or sieve-plate full of inhalent pores. In some sponges there is a constriction near the outer end of such crypts, guarded by a true muscular sphincter, which keeps undesirable objects from entering with the inhaled water. These are chones, the outer chamber being the ectochone, the inner the endochone or subcortical crypt.

Subdivision of Labor. See DIVISION OF LABOR.

Subepidermal Tissue. In Botany, hypoderma, immediately underlying the epidermis.

Subercase, DANIEL AUGER DE, ab.1655–ab.1715. Gov. of Placentia, Newfoundland (Canada), 1703, and of Acadia 1706; active against the English; forced to surrender Port Royal 1710.

Suberification. See CUTINIZATION.

Suberin. See CORK.

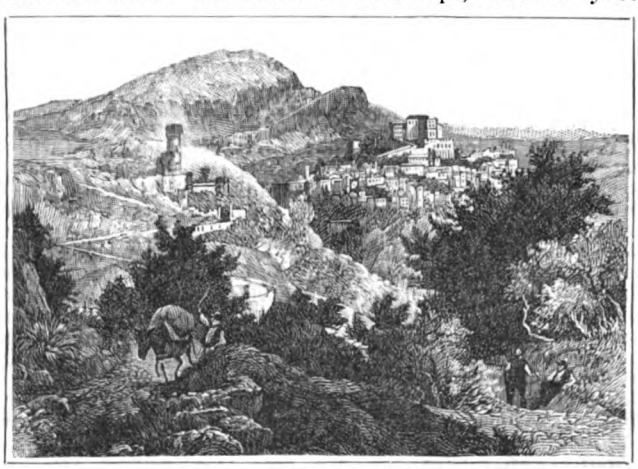
Suberization. Modification of a tissue into cork.

Subfamily. Group of genera, inferior in rank to a family. See TRIBE.

Subgenital Pits. Four open cavities in the subumbrella of discophorous *Medusæ*, into which the generative glands project.

Subgenus. Division of a genus, consisting of a group of closely related species.

Subiaco. Ancient Sublaqueum. Town of Italy, 16 m. s.e. of Tivoli. A cave near Subiaco is the site of one of the earliest monastic institutions of w. Europe, founded by St.



Subiaco.

Benedict and rebuilt 817. Here also is the monastery of Santa Scolastica, founded in the 5th century, where the printing press was first used in Italy 1464; a Lactantius was the first book published 1465. Altitude 1,340 ft., pop. 7,300.

Subject. Thing, entity, or agent to which properties, static or dynamic, physical or psychical, belong; in Psychology, the Ego or Self, which is the ground of mental phenomena, and opposed to the object.

Subjective. Pertaining to the subject, and denoting either what is internal as opposed to external, or what is peculiar to the subject and not found in the object; individual as opposed to universal.

Subkingdom. One of the great subdivisions of the vegetable kingdom, as the *Spermatophyta* and *Bryophyta*. See BOTANY.

Subkingdoms (OF ANIMALS). First great groups into which the Animal Kingdom is divided; viz., *Protozoa*, *Spongiaria*, Cœlenterates, Vermes, Molluscoids, Mollusks, Arthropods, Tunicates, and Vertebrates. There are a few genera not easily included with the above, and sometimes placed by themselves, as *Mesozoa* and *Enteropneusta*. Some modern writers include the *Spongiaria* with the Cœlenterates, the Molluscoids with the Vermes, and the Tunicates with the Vertebrates (*Chordata*).

Sublapsarianism. Milder theory of predestination, which ascribes to the divine Decrees merely the election of

some to life, while others are left to fall by their own devices; opposed to SUPRALAPSARIANISM (q.v.).

Sublician Bridge. See PONS SUBLICIUS.

Sublimate, CORROSIVE. See MERCURIC CHLORIDE.

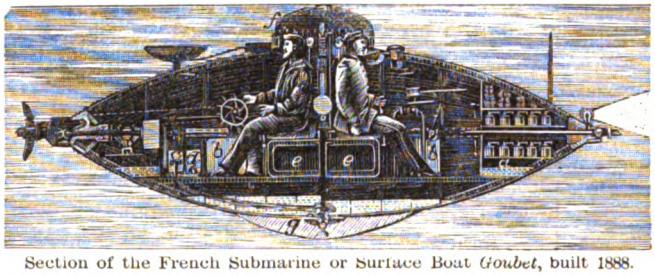
Sublimation. Process or result when a solid passes at once into the state of a vapor without passing through the intermediate state of liquidity. The sublimation of arsenic, of solid carbonic acid, and of snow are familiar examples.

Sublime Porte. See PORTE.

Submarine Forests. See PEAT and FOSSIL.

Submarine Mines. See MINES, MILITARY.

Submarine Navigation. Submarine boat was proposed by William Bourne of London 1578; Cornelius Drebell, a Dutchman, is said to have constructed one in London 1624, propelled by oars. Other experiments were made by Borelli and Papin 1672, Stapleton 1693, and David Bushnell of Conn. 1775. The latter was intended for submarine warfare, was propelled by a hand screw, and had an hour's supply of air; it carried a torpedo to fasten to the bottom of a ship. Robert Fulton in 1800 constructed a boat for the French government which carried a torpedo. In 1863 the Confederates, by means of a submarine boat, blew up the U. S. ship *Housatonic* off Charleston, but were carried down with the ship. Nordenfelt of Stockholm, in 1886, built a boat, propelled by steam, which sunk 30 feet and made a speed of 5 m. per hour; it was submerged by screws. In France the *Goubet* was successfully tried in 1889:



Section of the French Submarine or Surface Boat *Goubet*, built 1888.

a, the electric accumulators; *b*, tanks for compressed air; *c*, *d*, pumps; *e*, *e*, engines; *f*, cupola; *g*, the safety or emergency weight, which, in event of pumps or machines breaking down, can be detached, when the vessel at once rises to the surface. When proceeding on the surface only the cupola, *f*, is visible above water.

it was 16.4 ft. long, 3.5 ft. beam, 5.8 ft. deep, propelled with a screw by electricity from storage batteries, had a detachable keel and carried a torpedo. A later invention by Gustave Zede is 56 ft. long. In U. S. George C. Baker invented a boat, propelled by electricity from storage batteries acting on a screw, with two upright screws for perpendicular motion. J. P. Holland of New York has devised a boat propelled by a petroleum engine 8 m. per hour, 6 m. per hour under water, and compressing air for breathing and for projecting the torpedo. It also has rudders for vertical steering. The objection to submarine navigation is the slow speed so far attained and the difficulty of distinguishing objects at a greater distance than 25 ft. at a depth of 50 ft. To steer in anything but a straight line is very difficult, without losing the knowledge of the position. Moving just below the surface the boats are a success.

Submarine Telegraphy. See ATLANTIC CABLE and TELEGRAPHY.

Submentum. Piece in insects which articulates with the mentum (or palpiger), and attaches its parts to the gula or throat.

Submerged Weir. One where the level of the tail water is higher than the crest of the weir, so that the contraction is suppressed and the flow disturbed.

Subnormal FOR ANY POINT OF A CURVE. Projection of the normal, limited by the points of contact with the curve and of intersection with a fixed line, upon this line as a base of projection. In rectangular co-ordinates the axes are taken as bases; commonly the axis of X. In polar co-ordinates, the base is a line perpendicular to the radius vector of the point of normal contact.

Subœsophageal Ganglion. Most anterior ganglion of the ventral nerve-chain of Arthropods and annulated worms.

Suboperculum. Plate or scale lying ventral to the opercular plates.

Suborder. Group of families subordinate to an order.

Subordination. Willing submission to the direction and orders of superiors: the essential element of discipline in making the military organization efficient in carrying out the will of the commander.

Subpœna. Judicial writ for bringing parties or witnesses before a judicial tribunal. Its form, method of serving and enforcing, are regulated by statute, or by court rules.

Subrogative. Equitable right to succeed to the legal position of another; notably of a surety to succeed to the rights against his principal possessed by the creditor whose claim he has been compelled to discharge.

Subsidiary Quantities. Elements introduced to facilitate reduction or solution, as the angle used in the reduction of cubic equations.

Subsidy. Amount paid by government to a person or corporation to help in the foundation of some work that is expected to be of public as well as individual advantage.

Subsistence Department. This provides, under the direction of the Secretary of War, for the distribution and expenditure of funds appropriated for subsisting enlisted men and for purchasing articles kept for sale to officers and enlisted men. In the U. S. army it consists of 1 commissary-general (brigadier-general), 5 assistant-commissary generals (2 colonels and 3 lieutenant-colonels), 17 commissaries (8 majors and 9 captains), and 120 commissary-sergeants.

Subsoiling. Process of stirring the subsoil without lifting it to the surface; done by means of a special tool called a subsoil plow, following in the furrow of an ordinary plow. It is of advantage on heavy lands in allowing the water to sink more rapidly into the subsoil, thus in part performing the office of drains; and also, to some extent, in allowing the roots of plants more readily to enter and feed on the subsoil. It is scarcely profitable on drained lands for ordinary crops.

Substance. Permanent ground of phenomena which are changeable, or supposed reality which supports attributes, static or dynamic, and is synonymous with subject in its broader meaning. It is supposed to be material, spiritual, or both.

Substitute. Person accepted for military service in place of one who has been conscripted.

Substitution. In Chemistry, replacing of one element by another in a compound.

Substitution, LAW OF. Tendency of producers to choose just those factors of production the sum of whose supply prices is less than that of any other set.

Subtangent. At any point of a curve, projection of the tangent, limited by the points of tangency and of intersection with a fixed line, upon this fixed line as a base of projection. Bases of projection are taken, as for the subnormal.

Subtraction. In Arithmetic, process of ascertaining how much one number (minuend) exceeds another (subtrahend); in Algebra, process of finding such a quantity as, added to one of two quantities (subtrahend), will produce another (minuend). In either case, the result is the remainder. In algebraic subtraction, if the subtrahend be the greater (numerically), the remainder will be negative. Algebraic subtraction is performed by changing the signs of the subtrahend and then adding.

Subulate. In Botany and Zoölogy, awl-shaped organs of any kind.

Subumbrella. See UMBRELLA.

Subungulata (POLYDACTYLA). See UNGULATA.

Subura. District of ancient Rome, occupying the valley between the Esquiline, Quirinal, and Viminal hills; a crowded, noisy, disreputable region. See ROME.

Subverticillate. Imperfectly whorled.

Subway. Railroad track running through a city either in tunnel or beneath the surface. The most costly one in the U. S. is that in which the railroads enter New York City above

The up and down Tunnels, London Subway.

42d Street; its length is 4½ m., its cost was $6,400,000. The most extensive are in London. The inner circle, 8½ m. in extent, was opened 1863. Later extensions make the total length

nearly 40 m.; one of these runs under the Thames, and is operated by electric traction. In Baltimore an underground tunnel for the Baltimore and Ohio R.R., 10 m. long, was completed 1892.

Subzonal Membrane. Somatic mesoblast which lines the inside of the false ammon; in embryos of higher vertebrates.

Succession. In Roman Law, acquisition of another's legal rights or obligations; in English Law, continuance of the title to property in a corporation notwithstanding death or change of its members; sometimes devolution of title by will, deed, or the laws of descent.

Succession, WAR OF. See SPANISH SUCCESSION.

Succinamide. $CONH_2.CH_2.CH_2.CONH_2$. Amide of succinic acid; solid, mpt. 242° C.; prepared by the action of ammonia upon ethyl succinate.

Succinic Acid. $C_2H_4:(COOH)_2$. Dibasic acid; white crystalline solid, mpt. 235° C. It occurs in amber, in plants and fruits, and can be prepared synthetically by numerous reactions. It is made commercially by the distillation of scrap amber.

Succinyl. $.CO.CH_2.CH_2.CO.$ Group, $C_4H_4O_2$, conceived to be derived from succinic acid by the removal of two OH groups. The combination is of frequent occurrence. See SUCCINAMIDE.

Succory. See CHICORY.

Succoth. 1. Point in Lower Egypt, at which the Israelites stopped in their exodus (Ex. xii. 37). 2. Camping-place of Jacob, e. of Jordan, on leaving Esau; later its inhabitants refused to aid Gideon against the Midianites, and were punished (Judges viii.).

Succulent. Having a soft, juicy flesh or pulp.

Suchét, LOUIS GABRIEL, 1770–1826. French general, distinguished in Napoleon's campaigns, and especially in Spain 1809–12; Marshal 1811, Duke of Albuféra 1812. *Memoires*, 1829–34.

Suchet, PIERRE JOSEPH, 1734–1793. Haytian historical writer, guillotined in France.

Sucker. Branch or shoot from the base of a stem, rhizome, or root.

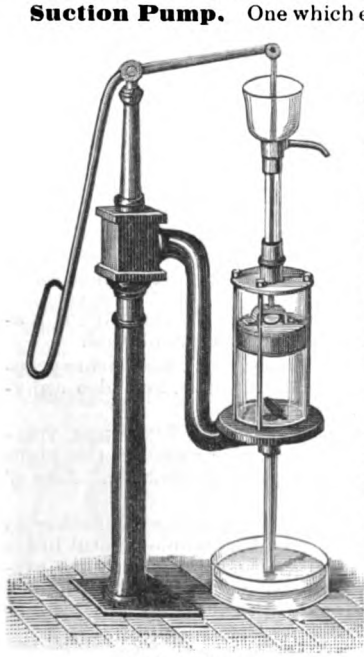
Suckling, SIR JOHN, 1609–1642. English lyric poet and playwright.

Sucre, or CHUQUISACA. Capital of Bolivia, on e. slope of the Andes; founded 1539. Pop. ab.26,000.

Sucre, ANTONIO JOSÉ DE, 1795–1830. Venezuelan general, prominent under Bolivar in the liberation of Ecuador and Peru; Pres. of Bolivia 1826–28. He repelled a Peruvian invasion of Ecuador 1829.

Sucrose. See SUGAR.

Suction Pump. One which exhausts the air from a tube, the water then rising. It will not work if placed more than 33 ft. above the level of the water to be raised.



Suction Pump.

Suctoria. See ACINETARIA and HIRUDINEA.

Suctoria (RHIZOCEPHALA). Group of parasitic Barnacles, with tubular or sac-like bodies, without segments or appendages; the peduncle has root-like branches that penetrate the tissues of the host, for absorbing nutriment. Neither mouth nor digestive canal is present.

Sudamina. Eruption consisting of minute vesicles, either clear or pearly, occurring near the termination of certain fevers, *e.g.*, typhus, typhoid, rheumatic. It is a symptom of depressed vitality.

Sudan. See SOUDAN.

Sudermann, HERMANN, b.1857. German dramatist and novelist. *Ehre* (*Honor*), 1888; *Sodoms Ende*, 1890; *Heimath*, 1892. His *Magda* was acted in French, Italian, and English versions 1895–96. Among his tales are *Dame Care*, 1888, tr. 1892; *Katzensteg*, 1889; *The Wish*, tr. 1895.

Sudetic Mts. Between Moravia and Silesia; extension eastward of the Reisengebirge. Ht. ab.3,000 ft.

Sue, MARIE JOSEPH EUGÈNE, 1804–1859. A French romancer, voluminous, popular, and readable, but of low tone; Deputy 1850, exiled 1852; best known by *The Mysteries of Paris*, 10 vols., 1842, and *The Wandering Jew*, 10 vols., 1845. His *Mysteries of the People*, 16 vols., 1849–57, was condemned by the courts.

Suet. Hard, solid fat, near the kidneys of sheep and oxen. Beef suet is used in cooking, and purified mutton suet in pharmacy as an ingredient in ointments.

Suetonius, CAIUS TRANQUILLUS, b.ab.70. Secretary of Hadrian. His *Lives of the Twelve Cæsars*, tr. 1732, are prized for the information which they contain: several other biographies and two grammatical treatises are attributed to him.

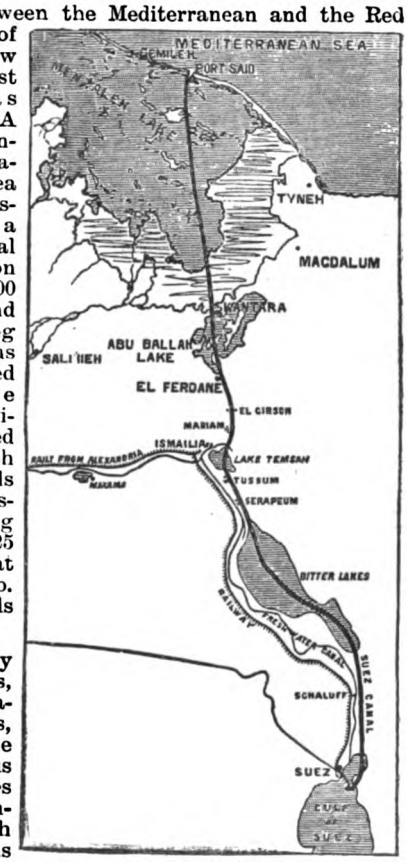
Suevi. German tribes, who in Cæsar's time occupied Suabia (named from them) and part of Gaul. Some of them were in Spain later.

Suez. Egyptian town at the head of the Red Sea; of commercial importance in ancient times, and since 1869. Pop. ab.13,000.

Suez, GULF OF. West arm of the Red Sea, between Egypt and the peninsula of Sinai. It is the Arabian Gulf of the Greeks and the Gulf of Heroöpolis of the ancients. Near the present head of the gulf the Israelites are supposed to have crossed. Length 200 m., average breadth 30 m.

Suez, ISTHMUS OF. Neck of land connecting Asia and Africa, having s. the Gulf of Suez and n. the Mediterranean, and crossed by the SUEZ CANAL (q.v.). The surface is mostly moving sands, interspersed with rocky elevations, and salt marshes, the ancient crocodile lakes.

Suez Canal. Between the Mediterranean and the Red Sea, 90 m. long, and of size sufficient to allow the passage of the largest vessels. Its cost was nearly $100,000,000. A canal existed here in ancient times: ab.1798 Napoleon conceived the idea of reopening it. De Lesseps organized 1854 a company with a capital of 200,000,000 francs, soon increased to 300,000,000 francs, of which England owns the controlling share. The canal was begun 1858, and opened Nov. 17, 1869. Since March 1, 1887, night navigation has been allowed through the entire length of the canal to all vessels provided with the necessary electric lighting apparatus. It is 325 ft. wide at top, 72 ft. at bottom, and 28 ft. deep. Of late some 3,000 vessels pass annually.



Map of Suez Canal.

Suffixes. Originally independent words, placed in a modifying capacity after other words, and acquiring in time an inflective force. Thus *like* becomes *ly*, and gives a purely adverbial meaning to the word to which it is attached. Pronouns suffixed to verbs become mere endings of a specific person, as the *m* in *am* indicates "I" or the first person.

Suffocation. See ASPHYXIA.

Suffolk. See SWINE.

Suffolk Punch. See HORSE.

Suffragan. Diocesan bishop in relation to his metropolitan; in Europe, sometimes an auxiliary bishop in relation to a diocesan.

Suffrage. Privilege of voting at political elections; regulated by constitutions and statutes; not a political right.

Sufism. Mohammedan mysticism; introduced by Rabia, 7th century; extended by Abu Said, founder of a monastery at Khorassan ab.815. It has exerted great influence on Persian literature and religion; its adherents have been variously pietists, pantheists, and freethinkers.

Sugar (CANE SUGAR, SUCROSE, or SACCHAROSE). $C_{12}H_{22}O_{11}$. This occurs in the juice of sugar cane, sugar beet, maple, palm trees, and many other plants. It forms monoclinic crystals, sp. gr. 1.61, mpt. 160° C.; at 200° C. it is converted into CARAMEL (q.v.). At 0° C. it is soluble in half its weight of water; at 50° C. it is soluble in ⅛ its weight of water. Its water solution is LÆVOROTATORY (q.v.). It is insoluble in absolute alcohol; with dilute alcohol it increases with the dilution. Acids and ferments invert it into dextrose and lævulose. This must take place before fermentation with yeast will take place. It is determined in water solution by a POLARISCOPE (q.v.).

The world's production of cane sugar in the year 1894–95 was estimated at 3,436,700 tons; Europe produced 4,866,000 tons of beet sugar and the U. S. ab. 20,000 tons. Of cane sugar Cuba produced 975,000 tons and the U. S. 285,000 tons. The U. S. also produce ab. 20,000 tons of maple sugar. India produces 100,000 tons of palm sugar.

See CANE SUGAR, CARAMEL, DEXTROSE, GLUCOSES, LACTOSE, LÆVULOSE, MALTOSE, MAPLE, MILK SUGAR, MOLASSES, and SORGHUM.

Sugar, BEET. The sugar beet is the result of cultivation, being derived from the wild *Beta maritima*, several varieties having been developed. It flourishes best in a northern temperate climate. The beets weigh from 1.5 lbs. to 2 lbs. and contain from 10 to 15 per cent of sugar. They are reduced to a pulp by circular saws, 25 per cent of water is added and the juice expressed by a hydraulic press, or extracted by the diffusion process. An excess of lime is added to the juice to neutralize acidity and precipitate the coloring matter; carbon dioxide is passed through to precipitate the lime and the whole is clarified by a filter press. The solution is then concentrated in a vacuum pan to crystallization. The yield in Germany is from 1,500 to 2,300 lbs. per acre, and in France, up to 2,700 lbs. The molasses is too saline for food and is used in making alcohol. Sugar was produced from the beet in Germany 1798 by Achard, in France 1782 by Rosier, in the U. S. 1830; in the latter were five factories in 1895.

Sugar, CANE. *Saccharum officinarum.* This was cultivated in India before the Christian era; the boiling of sugar was practiced on the Ganges in the 7th century. The Arabs first practiced sugar refining in the 7th century, and also carried the cultivation of the cane along the Mediterranean to Spain. The Spaniards carried it to San Domingo 1494. It was introduced into the U. S. 1791. Sugar cane flourishes best in subtropical countries. The cane, whole or in cuttings 2 ft. long, is laid in furrows 4 to 6 ft. apart in W. Indies, 8 ft. apart in Louisiana; the plants are from 2 to 5 ft. apart. In the W. Indies the planting takes place in the fall, the crop being gathered in the spring; in Louisiana the reverse of this. The young canes grow from the joints of the cane. Two or three annual crops are obtained from a planting in the U. S.; in the W. Indies as many as fifteen. The plant is from 6 to 15 ft. high, and from 1 to 2 in. diameter. The contents of sugar is from 12 to 18 per cent, of which up to 86 per cent is obtained by the mill, and by the diffusion process up to 95 per cent. The cane juice is expressed by passing between heavy rolls of the sugar mill, or it is extracted by the diffusion process. For the latter the cane is cut into chips and placed in a series of iron vessels, with perforated bottoms, each holding 2 tons. Water passes from one vessel to the next, and so on through the series; the cane in the first vessel being nearly exhausted and the last vessel having fresh cane, the solution thus becoming concentrated. The first vessel is then refilled with cane and becomes the last of the series, and what was the second becomes the first, and so on. This process is used to a limited extent with cane, but is largely used with beets. The juice is now strained and milk of lime added to it in a clarifier to neutralize the acidity and heated to 140° F. to coagulate the albuminous substances. It is then boiled down to crystallizing point in a series of copper pans, baled into a cooler and then into molds to crystallize. In 18 hours the plug in the bottom of the mold is drawn and the molasses drained off, the last being forced out by water from a layer of moist clay laid upon it. For muscovado the sugar is transferred from the cooler into hogsheads, the molasses draining from holes in the bottom. On some plantations the juice after skimming is run through bag- and bone-black filters for decolorization, concentrated in a vacuum-pan and, after crystallizing, the sugar is freed from molasses by a centrifugal machine. The yield of sugar per acre reaches 2,000 lbs. in the U. S., and 5,000 lbs. in W. Indies. The molasses consists of a solution of saccharose, dextrose and lævulose with saline substances of the juice. The first two are about equally sweet, the dextrose is less sweet, 3 parts being equal to 2 parts of the others.

Sugar-cane (*Saccharum officinarum*).

Sugar, MAPLE. This is obtained from *Acer saccharinum* of temperate climates. Two holes are bored in the tree two feet above the ground on the southern side and reeds or metallic spiles are introduced. The sap runs from February to April, and contains an average of 3.5 per cent sugar, requiring 4 gals. of sap for 1 lb. of sugar. It is evaporated in an open pan, flowing through devious furrows over it. The average yield of a tree per year is 3 lbs. besides the syrup; the trees last up to 30 years.

Sugar, PALM-TREE. This is obtained from several species of palm trees in India. The trees are tapped as with the maple, and the season is from November to February. A good tree yields 30 lbs. of sugar a year and lasts up to 30 years.

Sugar, SORGHUM. *Sorghum saccharatum* has been cultivated in the U. S. since 1853. It was originally from Africa. It contains up to 15 per cent of sugar. The presence of gum, starch and other substances interferes with the crystallization of the sugar. By adding alcohol to the somewhat concentrated juice, these substances are precipitated. After filtering the juice can be concentrated to crystallization. During the payment of sugar bounties, 1892–94, the average crop was 5.3 tons of cane per acre, yielding 82.5 lbs. of sugar per ton, equal to 437 lbs. of sugar per acre. 3,000,000 lbs. were produced 1892–94. Without the bounty this would not be profitable, and molasses with some incidental sugar is made. See SORGHUM.

Sugarberry. See HACKBERRY.

Sugar Bounties. These were granted by the U. S. to producers in that country of sugar from sugar cane, sorghum, beets and maple, 1892–94. for sugar 90° polariscope or over 2 cts. per lb., 80°–90°, 1¾ cts. Total bounties paid were $28,817,108.14, expenses $2,724,768.59, total $31,541,876.73.

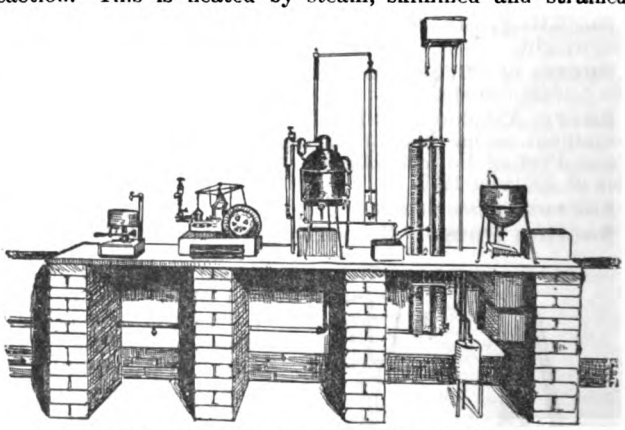
Sugar Cane. See SUGAR.

Sugar Meal. See GLUTEN MEAL.

Sugar of Lead. See ACETATE OF LEAD.

Sugar of Milk. See LACTOSE.

Sugar Refining. With cane and beet sugar this is effected by dissolving the sugar in water to 30° B., adding to this calcium superphosphate and then lime to alkaline reaction. This is heated by steam, skimmed and strained, mixed with pine sawdust and passed through a filter press. The solution is then decolorized by passing through a bone-coal filter and evaporated to crystallizing point in a vacuum pan. The molasses is separated from it by centrifugal machine, or in molds by forcing it out by a sugar solution.



Lehigh Laboratory—Sugar Refinery Model.

Sugars. Many CARBOHYDRATES (q.v.) with saccharine properties. In constitution they are all alcohols, and also anhydrides, ketones, or aldehydes. See SUGAR.

Sugden, EDWARD BURTENSHAW, LORD ST. LEONARDS, 1781–1875. Knighted 1829. English jurist, recognized as the highest authority on the law of real property in his time. *Law of Vendors and Purchasers*, 1805.

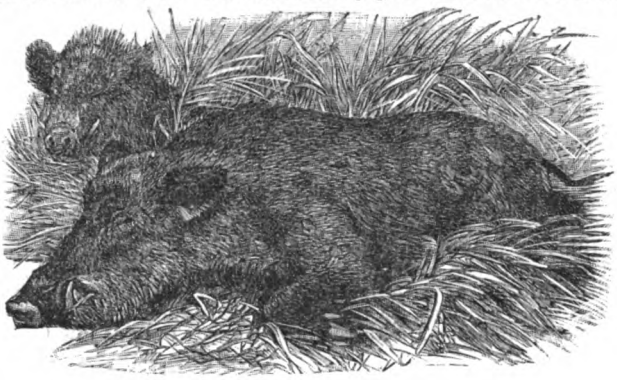
Suggestion. 1. Process of one idea calling up another to consciousness by ASSOCIATION (q.v.). The whole mental life is a series of suggestions, each idea being determined by the preceding. 2. In HYPNOTISM (q.v.), arousing in the mind of the subject of an idea, belief, or impulse in any way, but usually by some definite sign or command by the operator.

Suhm, PETER FREDERIK, 1728–1798. Danish historian.

Suicide. In Law, deliberate and intentional self-murder; formerly a crime in Britain entailing a shameful burial and the forfeiture of property. In the U. S., only attempts at suicide are criminal. Annual suicide rate per 100,000 population: Saxony 31, Denmark 25.8, Austria 21.2, Switzerland 20.2, France 15.7, German Empire 14.3, Sweden 8.1, Norway 7.5,

Belgium 6.9, England and Wales 6.9. Scotland 4, Italy 3.7, Netherlands 3.6, United States 3.5, Russia 2.9, Ireland 1.7, Spain 1.4.

Suidæ (SETIGERA). Family of bunodont, even-toed *Ungulates*, having the lateral toes short, the skin covered with bristles, the canine teeth well developed and forming large tusks in the male. In the young pig there are 4 deciduous molars, but the first is retained up to the third year of life, when the 5 molars that stand behind it belong to the permanent or second set. Our domestic pig is descended from the



Wild Boars.

Wild Boar, *Sus scrofa*, but the pigs of China are referred to a distinct Indian species. In America, from Paraguay to Arkansas, the family is represented by the Peccaries. These occur in flocks, have no tail, have a cannon-bone, and the external toe of the hind foot is reduced to a metapodial splint. The Babyroussa, of the Malay Peninsula, is peculiar in the great growth of the upper canines, which grow, in the male, curved backward up over the face; they have also long lower canine tusks.

Suidas. Author of a Greek encyclopedic lexicon which gives a great variety of literary and linguistic information; personally unknown; probably before 1100.

Suine. See OLEOMARGARINE.

Suint. Peculiar grease found upon sheep's wool. It consists of a mixture of the potassium salts of stearic and other fatty acids, with a combination of these acids with cholesterin. See LANOLINE.

Suite. Composition for either solo instrument or orchestra, consisting of a series of pieces in the same key, but arranged to form an agreeable contrast in time. It was much cultivated ab.1650–1750, when the pieces were the admired dances of the period. In its fundamental form it embraced four movements, allemande, courante, sarabande and gigue; to these were sometimes added a gavotte, passepied, branle, minuet or bourrée. Modern forms are employed in the modern suite, and the old law of sameness of key has been abolished.

Suleiman. See SOLYMAN.

Suleiman Pasha, 1838–1883. Turkish general, prominent in the wars with Servia 1876 and Russia 1877; defeated near Philippopolis Jan. 1878.

Suliman Mts. Range of s. Asia, trending n. and s., separating Afghanistan from the Punjab. Length ab.360 m., greatest altitude 11,295 ft.

Sulina. Branch of the Danube, near its mouth.

Suliotes. Albanian Christians who resisted the Turks till 1803, and were then massacred or deported to the Ionian islands. In the Greek war of independence they bore a heroic part.

Sulla, LUCIUS CORNELIUS, 138–78 B.C. Officer under Marius in Africa 107, and against Teutones and Cimbri 104–101; proprætor of Cilicia 93–91; Consul 88; conqueror of Mithradates 87–83, and of the Marian party under the walls of Rome 82. As dictator, 82–79, he proscribed his enemies, caused the death or exile of thousands, and was eminent for cruelty and vice.

Sulla.

Sullivan, ALEXANDER MARTIN, 1830–1884. Irish journalist, imprisoned 1868; M.P. 1874–82.

Sullivan, SIR ARTHUR SEYMOUR. b.1842. English composer; prof. Royal Academy, principal National Training School of Music; knighted 1883. He began his career as composer in the severe style with oratorios, *Prodigal Son*, 1869, *Light of the World*, 1873, *Martyr of Antioch*, 1880, and has written overtures, services, songs, etc.; but his most lasting successes were obtained in the operettas with text of W. S. Gilbert: *Trial by Jury*, 1875; *The Sorcerer*, 1877: *H.M.S. "Pinafore,"* 1878; *Pirates of Penzance*, 1880; *Patience*, 1881; *Iolanthe*, 1882; *Princess Ida*, 1884: *Mikado*, 1885; *Ruddigore*, 1887; *Yeomen of the Guard*, 1888; *Gondoliers*, 1889, and *Utopia*, 1893. He also composed a grand opera, *Ivanhoe*, 1891, and a cantata, *Golden Legend*, 1886.

Sullivan, BARRY, 1824–1891. English tragedian, in U. S. 1857–60 and 1875.

Sullivan, FRANCIS STOUGHTON, LL.D., b. ab.1740. Prof. Dublin. *Constitution and Laws of England*, 1772–76.

Sullivan, JOHN, LL.D., 1740–1795. Delegate to Congress 1774 and 1780; Brig.-gen. 1775, Major-gen. 1776–80; active in Canada and N. J., at Brandywine and Germantown, and against the N. Y. Indians; Atty.-gen. of N. H. 1782–86, Pres. 1786–89; U. S. District Judge from 1789.—His brother, JAMES, LL.D., 1744–1808, was Judge of Mass. Superior Court 1776–82, in Congress 1784–85. Atty.-gen. 1790–1807, and Gov. 1807–8. *Hist. Maine*, 1795; *Land Titles in Mass.*, 1801.—His son, WILLIAM, LL.D., 1774–1839, pub. *Public Men of the Revolution*, 1834.—His brother, JOHN LANGDON, M.D., 1777–1865, patented a steamboat 1814.

Sullivan, JOHN LAWRENCE, b.1858 in Boston. Pugilist; victor in many contests; defeated by James J. Corbett 1892. See PUGILISM.

Sullivan, PETER JOHN, 1821–1883. Col. U. S. Vols., serving in the West; U. S. Minister to Colombia 1865–69. *Don Felix Letters.*

Sullivan's Island. Off Charleston, S. C.; 6 m. long; site of Fort Moultrie.

Sullivant, WILLIAM STARLING, 1803–1873. American bryologist. *Musci Alleghanienses*, 1846; *Musci and Hepaticæ of the U. S., e. of the Mississippi*, 1856; *Musci (of the Wilkes Expedition)*, 1859; *Icones Muscorum*, 1864.

Sully, MAXIMILIEN DE BETHUNE, DUKE OF, 1560–1641. Baron de Rosny; associate and Minister of Henry IV. of France; Duke 1606. By his resolute measures and personal supervision, he

Sully.

raised the finances from utmost disorder, lightened taxes, checked the dishonesty of officials, and encouraged trade, agriculture and internal improvements. *Memoires*, 1634–62, tr. 1834.

Sully, THOMAS, 1783–1872. American painter, of English birth. Many of his portraits have been engraved.—His son, ALFRED, U. S. A., 1821–1873, Brig.-gen. U. S. Vols. 1862–65, served in Va. 1861–62, and against Northwest Indians 1862–64.

Sully-Prudhomme, RENÉ FRANÇOIS ARMAND, b.1839. French poet, Academician 1881. *Works*, 5 vols., 1882–88.

Sulph. Prefix denoting compounds containing sulphur.

Sulphanilic Acid. $NH_2.C_6H_4.HSO_3$. Paramidobenzene sulphonic acid; monobasic; produced by the action of sulphuric acid upon aniline; magnificent rhombic crystals, not easily soluble in water; used in the manufacture of coal-tar colors.

Sulphates. Salts of sulphuric acid.

Sulphide, ORGANIC. Combination of sulphur with one or more organic groups or radicals; *e.g.*, ethylene sulphide, C_2H_4:S; phenyl sulphide, $(C_6H_5)_2$:S.

Sulphides. Salts derived from hydrogen sulphide; or compounds formed by the union of sulphur with some other element.

Sulphindigotic Acid. Product of the action of sulphuric acid upon indigo. See INDIGO EXTRACT.

Sulphites. Derivatives of sulphurous acid.

Sulphocarbamide. $S:C:(NH_2)_2$. Sulphourea; white crystalline solid, soluble in water; mpt. 171° C.; usually prepared by heating ammonium sulphocyanate. It is a weak base, and forms salts with mineral acids.

Sulphocyanic Acid. N : C·S·H. Yellow liquid, prepared from its salts. The potassium, ammonium and other salts are used in textile coloring. The potassium salt is made by fusing yellow prussiate of potash with sulphur and potash, the ammonium salt by heating carbon bisulphide with alcoholic ammonia. Sulphocyanates give a deep red coloration with ferric salts.

Sulpholeic Acid. Acid product, formed by the action of sulphuric acid on castor or olive oil. See ALIZARINE ASSISTANT.

Sulphonal. $(CH_3)_2:C:(SO_2.C_2H_5)_2$. Diethylsulphodimethylmethane; a disulphone; white crystalline solid, mpt. 126° C.; soluble in hot water; prepared by the oxidation of the corresponding sulphide; used in pharmacy as a hypnotic.

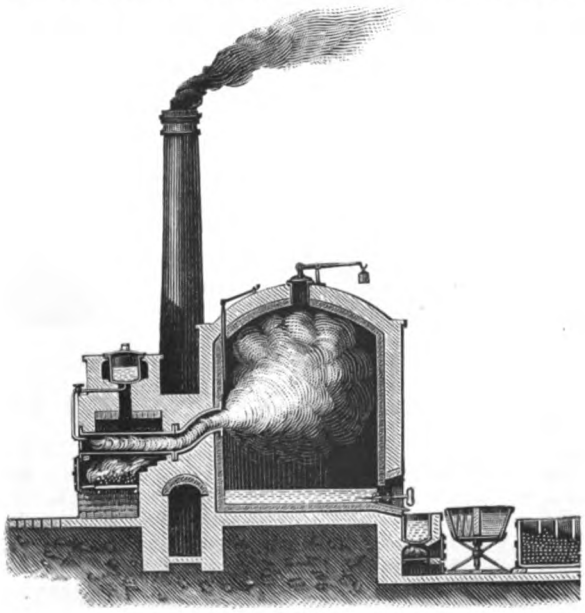
Sulphone. Combination of the group $:SO_2$ with two organic monobasic groups, ethyl sulphone $(C_2H_5)_2:SO_2$., phenylethyl sulphone, $C_6H_5.C_2H_5:SO_2$. These compounds are formed by the oxidation of the sulphides, and in the aromatic series by the action of sulphuric anhydride upon the hydrocarbons. See PHENYL SULPHONE.

Sulphonic Acids. Derived by the replacement of hydroxyl in sulphuric acid by an organic group. Thus from $\begin{matrix}HO.\\HO\end{matrix}SO_2$, ethyl sulphonic acid, $\begin{matrix}C_2H_5\\HO\end{matrix}:SO_2$ is derived. Some can be prepared by the oxidation of sulphides. Whenever strong sulphuric acid acts upon an aromatic compound, a sulphonic acid is formed. The acids are soluble in water, the salts usually crystallize well.

Sulpho Salts. Ordinary oxygen salts, in which the oxygen, either wholly or in part, has been replaced by sulphur; *e.g.*, potassium sulphocarbonate, K_2CS_3.

Sulphourea. See SULPHOCARBAMIDE.

Sulphur. S. At.wt. 32.06, sp. gr. 2.07, sp. ht. 0.177, mpt. 114.5° C., bpt. 440° C., valence II. IV. VI.; known to the ancients. It occurs in deposits in Sicily, Italy, Spain, California; also in



Sulphur Refining Apparatus.

many sulphides, sulphur waters, and sulphates. To extract it from its ores, the ores are piled up in such a way as to leave air passages, and the exterior is covered with earth or turf to prevent free access of air. The pile is ignited, a part of the sulphur burns; the heat thus generated is sufficient to melt the rest of the sulphur, which runs down to the bottom of the pile. At proper intervals it is drawn off. The crude brimstone thus obtained is distilled and run into molds, forming roll brimstone or stick sulphur. In the distillation the vapor which is first cooled is deposited as a fine powder, called flowers of sulphur. Stick sulphur is soluble in carbon disulphide; the flowers of sulphur is not. It is amorphous. Treated with oxidizing agents, it forms sulphuric acid. It is used for the manufacture of sulphuric acid, gunpowder, fireworks, matches, bleaching, and for vulcanizing rubber. Native sulphur abounds in regions of active and of extinct volcanoes, and also in connection with beds of gypsum or about the outlets of sulphur springs. Sicily has long furnished most of the native sulphur used in Europe and America.

Sulphur Auratum. Golden yellow powder; ANTIMONY PENTASULPHIDE (q.v.).

Sulphur Chlorides. See SULPHUR DICHLORIDE.

Sulphur Dichloride. SCl_2. Dark red liquid, sp. gr. 1.62, boiling at 62° C. with decomposition; decomposed by water in thiosulphuric acid; made by saturating the monochloride with chlorine at a temperature from 6° to 10° C. There are two other chlorides, S_2Cl_2 and SCl_4, both made by direct union of the elements. The tetrachloride exists only at low temperatures.

Sulphur Dioxide. SO_2. Density 2.21. Sulphurous anhydride; colorless, poisonous gas, of a pungent, suffocating odor; liquid at —17.8° C., sp. gr. 1.45, solid —79° C.; soluble in water, forming sulphurous acid; made by burning sulphur or iron pyrites in the air; used for bleaching straw, wool, silk, etc., as a disinfectant, and to prevent fermentation.

Sulphureted Hydrogen. H_2S. Hydrogen sulphide; colorless gas, with an odor of rotten eggs; found in sulphur waters; made by treating ferrous sulphide with hydrochloric or sulphuric acid; used extensively in chemical analysis; poisonous. The odor of sulphur waters and of rotten eggs is due to the presence of H_2S.

Sulphureted Hydrogen Group. Metals precipitated from solutions by sulphureted hydrogen; bismuth, silver, lead, copper, mercury, cadmium, gold, platinum, tin, antimony, and arsenic.

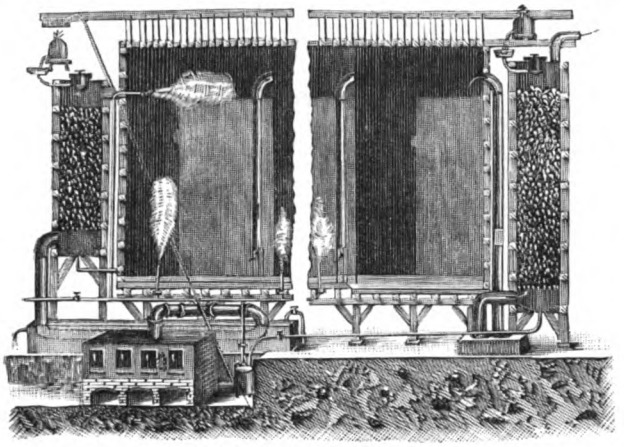
Sulphurets, or SULPHIDES. Combinations of sulphur with the metals; many are of great value as ores.

Sulphur Hexiodide. SI_6. Gray-black crystals, similar to those of iodine; obtained by diluting a solution of iodine and sulphur in carbon disulphide and allowing it to stand.

Sulphuric Acid. H_2SO_4. Sp. gr. 1.85, mpt. —26° C., bpt. 327° C. It distills without decomposition; it is a colorless, oily looking liquid when pure, and one of the strongest acids. It was known to the alchemists, Geber having made it from alum and Valentine in the 15th century by distilling ferrous sulphate. Its composition was determined by Berthellot 1782. The use of niter with sulphur was proposed 1740 by Lefevre and Lemery, and leaden chambers by Dr. Roebuck 1746, the absorption towers by Gay Lussac 1825, and the Glover tower by John Glover 1850. The use of pyrites dates from 1838. This acid is more largely used in the arts than any other. The strongest acid is used in making nitro-compounds and refining gold and silver; oil of vitriol in refining petroleum; tower and chamber acids in making superphosphates for fertilizers and a very large variety of manufactures. Most chemical industries make use of or are dependent upon it. 90 per cent of the world's product is used in the soda and superphosphate processes. England's product in 1878 was estimated at 850,000 tons, about half the world's product.

Sulphuric acid is made by burning sulphur or iron pyrites in a furnace with access of air, the oxygen of the latter converting the sulphur into sulphur dioxide. This is conducted, together with vapors of nitric acid, through a Glover tower filled with pieces of quartz or earthenware, and then through a series of large, sheet-lead chambers, into which steam or a spray of water is introduced. In these the sulphur dioxide is oxidized to sulphur trioxide by the nitric acid and combining with the water forms sulphuric acid. The waste gases from the last chamber, consisting of nitrogen and its oxides with a little sulphur dioxide, pass through two leaden Gay Lussac towers filled with coke over which sulphuric acid 1.7 sp. gr. drips; the latter combines with the nitrogen trioxide, tetroxide and pentoxide. The lower oxides and nitrogen are not combined and pass out the chimney connected with the last tower; this chimney serves to draw the gases through the entire apparatus. The loss of nitrogen in the lower oxides is compensated by the nitric acid, made from sodium nitrate and sulphuric acid, which is intro-

duced with the sulphur dioxide into the Glover tower, 2–6 parts of sodium nitrate being used to 100 parts of sulphur burned. The acid from the Gay Lussac towers is run into the top of the Glover tower with chamber acid and the nitrogen compounds are freed by the hot sulphur dioxide, and with the latter and water of the chamber acid pass into the chambers. The acid is thus concentrated in the tower, whose temperature is 300° C. The tower acid is further concentrated by evaporation in platinum pans or glass retorts, the water passing off leaving



Sulphuric Acid Apparatus.

the strongest acid, called oil of vitriol, sp. gr. 1.85. Chamber acid reaches sp. gr. 1.5 and tower acid 1.65.

Fuming sulphuric acid, $H_2S_2O_7$, sp. gr. 1.9, solid at 0° C., fumes in the air and is very corrosive. It was known in the 15th century. This is made in Bohemia by oxidizing pyrites contained in slate by exposure to moist air to iron persulphate and distilling the product in clay flasks, the acid passing off. It is also made by Winkler's process by passing sulphur dioxide and oxygen over platinized asbestos, where it is oxidized to sulphur trioxide, which is dissolved in sulphuric acid. This acid is used for dissolving indigo, and in the manufacture of aniline and anthracene dyes.

Sulphuric Acid, FUMING. See DISULPHURIC ACID.

Sulphuric Ether. See ETHYL ETHER.

Sulphur Monobromide. S_2Br_2. Deep red liquid, beginning to boil at 60° C.; decomposed by water; made by dissolving the requisite amount of sulphur in bromine. The higher bromides are not known with certainty.

Sulphur Monochloride. S_2Cl_2. Sulphurous chloride; yellowish red liquid; sp. gr. 1.70, bpt. 137° C. (uncor.); of characteristic, disagreeable odor. Its vapor irritates the mucous membrane. It is soluble in carbon bisulphide and benzene. It is made by distilling sulphur with stannous chloride, and is used in vulcanizing rubber.

Sulphur Monoiodide. S_2I_2. Lustrous crystals or gray crystalline mass; made by fusing sulphur and iodine.

Sulphur Rain. Rain which after evaporation leaves a yellowish powder, erroneously supposed to be sulphur; really the pollen of plants.

Sulphur Tetrachloride. SCl_4. Light, mobile, yellowish-brown liquid, decomposed by water into sulphur dioxide and hydrochloric acid; made by saturating the monochloride with chlorine at a temperature of —20° to —22° C. See SULPHUR DICHLORIDE.

Sulphur Trioxide. SO_3. Sulphuric anhydride; white, crystallized solids; mpt. 14.8° C. The liquid boils at 46° C. It is made by passing sulphur dioxide and oxygen over asbestos covered with finely divided platinum, and is used for making "solid sulphuric acid," which is almost pure $H_2S_2O_7$. It combines with water with violence to form sulphuric acid. It acts energetically as a dehydrating agent.

Sulphuryl Chloride. SO_2Cl_2. Liquid, easily decomposed by water; made by the action of chlorine on sulphur dioxide in direct sunlight.

Sulpicia, 1st cent. Roman poet, whose works are lost: a satire bearing her name is of later origin.—Another, somewhat earlier, is the supposed author of six elegies.

Sulpicians. Order founded 1642–45 at Paris to train youths for the priesthood.

Sulpicius Severus, ab.363–ab.420. French priest, biographer of St. Martin of Tours. His *Chronica* extend to 400.

Sultan. Mohammedan ruler, especially of the Turkish empire. The title was first assumed ab.1000.

Sulu (or SOOLOO) **Islands.** Between Borneo and the Philippines; first visited by the Spaniard Figueroa in 1578; in number 162; held by Spain since 1876. Area ab.1,550 sq. m., pop. ab. 100,000, chiefly Malays.

Sum. In arithmetical addition, number containing as many units as are contained in all the numbers added: in algebraic addition, aggregate of the expressions added, like quantities being united and others connected by plus or minus signs. In algebra the sum of two quantities having unlike signs is a difference, having the sign of the greater.

Sumach. Shrubs and small trees of the genus *Rhus*, natural order *Anacardiaceæ*, natives of N. America, Asia and s. Europe. The bark is used for tanning.

Sumach, POISON. *Rhus vernix*. Tall shrub of the Sumach family, growing wild in swamps in e. N. America, the foliage poisonous to the touch. The Venetian Sumach or Smoke-tree is not properly a sumach. Its leaves and twigs dye yellow and are used in tanning. The bark has been used as a substitute for Peruvian Bark.

Smoke-tree (*Rhus cotinus*), showing leaves, flowers, and fruit.

Sumarokov, ALEXANDER, 1718–1777. Russian dramatist, poet, and critic.

Sumatra. Island in the Indian Ocean, separated from the Malay Peninsula by Malacca Strait and from Java by the Strait of Sunda; 1,115 m. long, with a maximum breadth of 275 m. The interior is mountainous, with ranges running n.w. and s.e., parallel to the coast. It contains extensive fertile and highly cultivated plains. The s. part belongs to the Dutch. Its inhabitants are of Malay stock. The island was discovered by the Portuguese Lopez de Figuera 1508. Tobacco is exported to Europe and the U. S. Area ab. 163,000 sq. m., pop. ab. 3,000,000.

Sumbawa. One of the Sunda Isles, e. of Java; desolated 1815 by an eruption of its volcano Tambora. Area 54 sq. m., pop. ab. 150,000, Malays.

Sumerians. Supposed ancient inhabitants of Babylonia, preceding the Semites. The Akkadians were a branch of them.

Sumeru. See MERU.

Summary Proceedings. Those which are speedy and generally without a jury; *e.g.*, for evicting a tenant, collecting taxes, or punishment of contempt of court.

Summational Tone. See COMBINATIONAL TONES.

Summation of Stimuli. Physiological law of the nervous system; viz., that a stimulus inadequate by itself to bring about a response may, when acting with one or more other stimuli equally inadequate by themselves, produce the reaction.

Summer Eggs. Such as are produced from spring until autumn in many invertebrate animals, and which in many cases develop parthenogenetically and immediately; distinguished from winter eggs, which are generally fertilized, are protected by special shells, and rest over winter to develop the next spring.

Summerfield, JOHN, 1798–1825. English Methodist preacher, in the U. S. from 1821; noted for eloquence.

Summers, THOMAS OSMOND, D.D., LL.D., 1812–1882. Editor of many publications of M. E. Ch. South: author of commentaries and other books. *Refutation of Paine*, 1855.

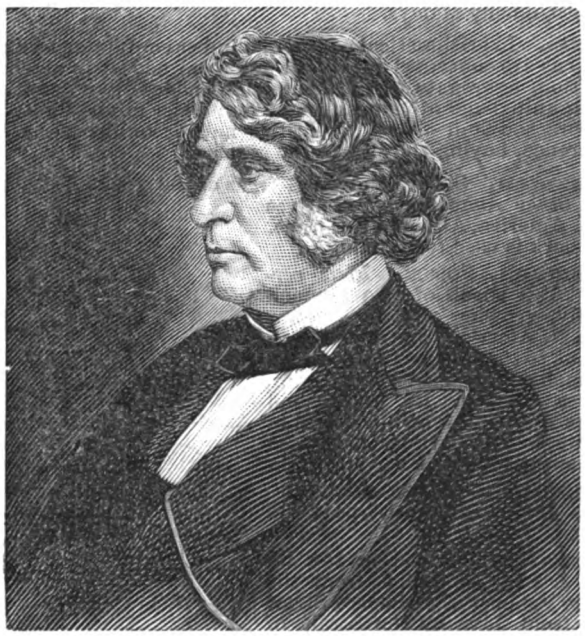
Summer's Islands. See BERMUDAS.

Summons. Instrument in law, notifying a party of a suit commenced against him; to bring a defendant into court; to give a person sued an opportunity to appear and answer; generally a citation to appear before a judge or magistrate.

Summum Bonum. Highest good; ultimate end of reasonable human action.

Sumner, CHARLES, 1811–1874. Lecturer at Harvard Law School 1835–37 and 1843; in Europe 1837–40; U. S. Senator from Mass. from 1851; eminent for learning, eloquence, and uncompromising earnestness; long the most brilliant and powerful

opponent of slavery; assaulted May 22, 1856, by Preston S. Brooks, M.C. from S. C., receiving injuries which disabled him till Dec. 1859, and from which he never wholly recovered. His later career was less useful and illustrious, for his eccentricities kept him in conflict with his party and with the ad-



Charles Sumner.

ministration; but the loftiness of his motives and aims was never questioned. He was chairman of the Senate Committee on Foreign Relations 1861–71: his last years were given mainly to the Civil Rights bill. *Works*, 15 vols., 1870–83; *Memoirs and Letters*, 4 vols., 1877–92.

Sumner, CHARLES RICHARD, D.D., 1790–1874. Bp. of Llandaff 1826, and of Winchester 1827–69. *Ministerial Character of Christ*, 1824.—His brother, JOHN BIRD, D.D., 1780–1862, Bp. of Chester 1828, Abp. of Canterbury 1848, pub. *Apostolical Preaching* and other books.

Sumner, EDWIN VOSE, U.S.A., 1797–1863. Gov. of New Mexico 1851–53; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; prominent in the Va. battles.

Sumner, INCREASE, 1746–1799. Judge Mass. Supreme Court 1782–97; Gov. from 1797.

Sumner, WILLIAM GRAHAM, LL.D., b.1840. Prof. Yale since 1872. *Hist. American Currency*, 1874; *Andrew Jackson*, 1882; *Economic Problems*, 1884; *Protectionism*, 1885; *Political and Social Science*, 1885; *Robert Morris*, 1892; *Hist. Banking*, vol. i., 1896.

Sumner's Method OF DETERMINING THE POSITION OF A SHIP AT SEA. In the ordinary method, the place is found by the intersection of a circle of latitude with one of longitude. Sumner substitutes, for these, two circles from every part of the circumference of which the altitude of the sun is the same. His method has some advantages.

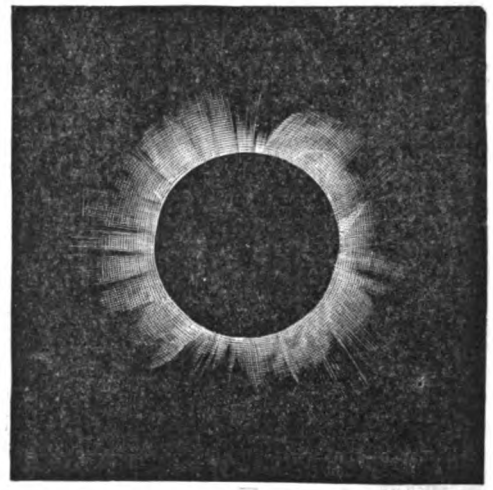
Sump. In Mining, extension of a shaft below the lowest working-level of a mine, into which the water of the mine is conducted, and from which it is pumped.

Sumptuary Laws. Laws, now generally obsolete, for the regulation of private habits, prescribing the quality and quantity of food, dress, and amusements, funerals, etc., in the supposed interest of economy and morality.

Sumter, THOMAS, 1734–1832. Officer of the American Revolution, serving with great gallantry in S. C. and N. C.; Brig.-gen. S. C. troops 1781; M.C. 1789–93 and 1797–1801; U. S. Senator 1801–9; Minister to Brazil 1809–11.

Sumter, FORT. At entrance to Charleston Harbor, S. C. On the secession of S. C., Dec. 1860, its surrender was demanded, and refused by Major Anderson. Gen. Beauregard opened fire April 12; it surrendered April 14, 1861: this marked the beginning of the Civil War. The fort was held by the Confederates during the war, and was shattered during the siege of Charleston.

Sun. Central body of the solar system. Diameter 866,500 m.; volume 1,300,000 times that of the earth; mass 332,000 that of the earth; gravity at surface 27.6 that at earth; density 1.41 that of water. The constitution is mainly if not en-



Sun.

Corona during Total Eclipse of the Sun, 12th December 1871, at Baikal, on the Malabar coast of India.

tirely gaseous, the heat being maintained by condensation and contraction of volume. See CORONA (SOLAR), EARTH (FIGURE OF), ECLIPSES OF THE SUN, and SUN SPOTS.

Sun, DURATION OF THE. From such data as are available it is believed that the sun cannot continue to give light and heat as at present for more than 10,000,000 years.

Sun, RADIATING POWER OF. See RADIATION.

Sun-Bittern (EURYPYGA). S. American heron-like bird with long tail, broad wings, plumage mottled and barred with white, brown, and blue: the neck is thin and short, the legs are short, and have all the toes on the same level. Allied species are found in Madagascar and in New Caledonia. They are connecting links between Herons and Plovers.

Sun-Crack. Formed at the time when the rock consolidated and due to heat. These cracks are oftentimes filled up by new material, which is often harder than the rock in which it occurs.

Sunda, STRAIT OF. Between Sumatra and Java.

Sunda Islands. E. of Java, including Flores and Timor. Sumatra and Java are sometimes included.

Sundanese. Malay tribes of w. Java; allied to the Javanese proper, but less cultured.

Sundarbans, or SUNDERBUNDS. Delta of the Ganges, from the Hoogli to the Megna, ab.165 m. Area ab.7,550 sq. m., mainly swamp and jungle.

Sunday. First day of the week; day upon which Christ rose from the dead, therefore called the Lord's day. At a very early date Christians met for worship on this day, and it has become the Christian Sabbath; Saturday being the Jewish Sabbath. There is no express authority in the New Testament for this substitution. See SABBATH.

Sunday Laws. For the preservation of the sacred character of the Lord's Day. Constantine, 321, ordered workshops to be closed. Alfred of England issued a similar decree 876. A statute of Charles II., 1676, forbade ordinary labor, trade, and legal processes. In the U. S. likewise Sunday is legally a *dies non*.

Sunday Letter. See DOMINICAL LETTER.

Sunday Schools. Begun 1780 by Robert Raikes at Gloucester, and in London 1784 by Rowland Hill; in America apparently by Asbury in Va. 1786. They spread rapidly, and soon became accessories of every place of worship, needing rooms or buildings of their own. The American Sunday School Union was organized 1824. Christendom in 1893 had about 225,000 schools, with ab.2,240,000 teachers and over 20,000,000 scholars: half of these are in the U. S. This does not include non-Evangelical Protestants or Roman Catholics; the latter are estimated to have 800,000 scholars in the U. S.

Sunderland. Seaport town of Durham, at the mouth of the Wear. It has a large shipbuilding interest and much commerce, especially in coal. Pop., 1891, 130,921.

Sunderland, Le Roy, 1802–1885. American M.E. preacher 1823–45, whose sermons produced strange physical effects; noted as a temperance and anti-slavery orator; denier of Christianity from 1845. *Pathetism*, 1847–50; *The Trance*, 1860.

Sunderland, Robert Spencer, Earl of, 1640–1702. Sec. of State 1679–81 and 1682–88; Lord Chamberlain 1697: a servile and treacherous politician.—His son, Charles, 3d Earl, 1675–1722, was Sec. of State 1706–10, Privy Seal 1715, and Prime Minister 1718–21. He was tried for corruption in connection with the South Sea scheme, and acquitted, though believed to be guilty.

Sundew. Insectivorous herbs of the genus *Drosera*, natural family *Droseraceæ*, natives of bogs in the n. hemisphere.

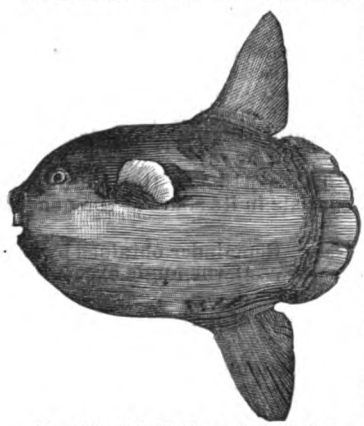
Sun Dial. See Dials.

Sun Dogs. Bright spots, resembling the sun, attendant upon solar halos, and accompanying the sun in his diurnal motion, as a dog follows its master. Two or more are frequently seen together, caused by refraction of solar rays through ice crystals suspended in the atmosphere.

Sundrops. *Kneiffia fruticosa.* Showy, yellow-flowered herb of the Evening Primrose family, native of e. N. America.

Sundt, Eilert, 1817–1875. Norwegian publicist.

Sunfish. 1. The true sunfishes belong to the *Centrarchidæ*. The body is deep and laterally compressed. The upper part of the operculum extends back, ear-like, and is dark-colored. There are ten or fewer spines in the dorsal fin. The sexes pair off during the breeding season, and excavate a circular nest which they guard until the young hatch. See Acanthopteri. 2. Mola, one of the *Plectognathi;* a bizarre looking fish apparently all head and higher than long.



Short Sunfish (*Orthagoriscus mola*).

Sunflower. Coarse yellow-flowered herbs of the genus *Helianthus*, natural order *Compositæ*, natives of America. The commonly cultivated large-flowered species is *H. annuus.* Native of tropical America, where it attains a height of 20 ft. Its seeds are an excellent food for poultry; an acre yields ab. 50 bu. of seeds, and each bu. 1 gal. of oil, which is little inferior to olive oil.

Sun-Grebes (Fin-Foots). Rail-like birds with lobed feet and the middle toe longest; they differ from true Grebes in having dull plumage and 18 tail feathers in their fan-shaped tail. Only four species are known, one in S. America, two in Africa, and one in s.e. Asia.

Sunnees, or Sunnites. Main body of Mohammedans, accepting the Sunna, or orthodox Tradition, as of equal authority with the Koran. See Mohammedanism.

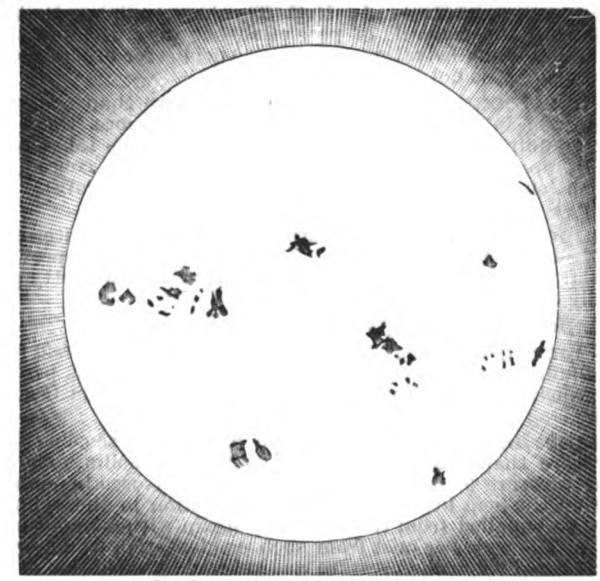
Sunn Hemp. *Crotalaria juncea.* Leguminous plant cultivated in India for its fiber and as a forage plant. It is better than jute, but inferior to true hemp.

Sunsets, Red. During the volcanic eruption on Krakatoa in the E. Indies in 1883, volcanic dust rose to a height of 20 m., whence it was carried round the earth by the upper air currents, producing for three years twilight glows, called red sunsets.

Sunshine Recorder. Apparatus for automatic record of the time, direction and intensity of sunshine at any locality. Its earliest form was Campbell's burning lens recorder: at present various forms of photographic or blue-print records are more generally adopted, as those of Stokes, Jordan, and Curtis.

Sun's Motion in Space. The sun is found to be moving toward a point in the constellation Hercules, right ascension 267°, declination +31°, with a velocity variously estimated, but which may be 16 m. per sec.

Sun Spots. Openings in the photosphere of the sun, caused, according to one theory, by eruptions from below, according to another by cool matter rushing down from above; mostly confined to zones on each side of the equator between latitude 5° and 45°. Occasionally a spot is large enough to be visible to the naked eye. The duration may be only a few



Sun Spots observed on Sept. 2, 1839.

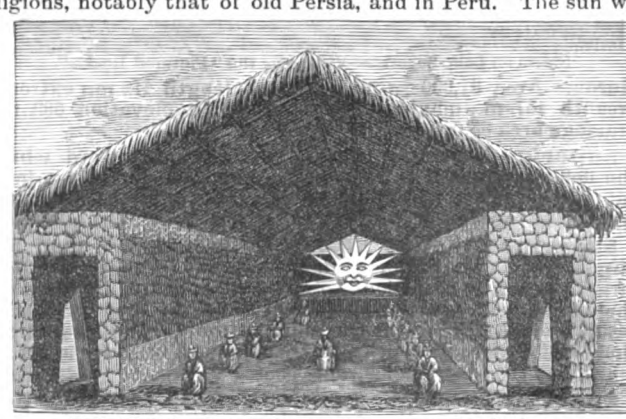
days, or it may extend to a year or more. See Period of Sun Spots.

Sun's Temperature. This has been variously estimated; the most reliable investigation seems to be that of Rosetti, who gives for the effective temperature 18,000° F.

Sunstone. Variety of feldspar (oligoclase or orthoclase) exhibiting internal yellowish, reddish, or salmon-colored reflections, from minute disseminated crystals of some accessory mineral. The best specimens come from Norway.

Sunstroke. Condition produced by exposure to excessive heat. There are two forms: (1) Heat exhaustion and (2) Heat stroke. 1. Prolonged exposure to high temperature, especially when combined with physical exertion, is apt to be followed by extreme prostration, collapse, and, in severe cases, delirium. The surface is usually cool, the pulse small, rapid and soft; the breathing easy though hurried; the temperature may be less than normal; while the vital forces fall into a collapse, the senses remain active. The individual need not be exposed to the direct rays of the sun, but the condition may come on when working in close, confined rooms during midsummer, or even be produced by artificial heat, as in the boiler room of an ocean steamship. The treatment includes the use of stimulants, ammonia is frequently valuable, and, whatever stimulant is used, it may be necessary to use it hyperdermically. When the temperature is below normal, a hot bath is indicated. 2. Heat stroke, thermic fever. This chiefly occurs in persons working very hard and exposed to the sun, especially if they have been drinking beer or whisky. There is unconsciousness with high temperature and the indications of a febrile condition. The indications for treatment are to reduce the temperature as rapidly as possible. Place the patient in a bath of the temperature of 70° F., use an ice pack, or rub the body with ice.

Sun Worship. Prominent element in many primitive religions, notably that of old Persia, and in Peru. The sun was



Temple of the Sun during the later reigns of the Incas.

generally regarded as associated with the masculine, as opposed to the moon, the symbol of the feminine principle in nature.

Superaxillary. Above the axil, as the buds of *Gymnocladus.*

Supererogation. In R. C. Theology, opinion that by following the counsels of perfection one may do more than enough for his salvation, leaving a surplus for others' shortcomings. It is not an article of faith.

Superfecundation. Entrance of more than one spermatozoön into an egg, particularly when more than one sperm unites with the female pronucleus. This takes place by fragmentation of the female nucleus and the consequent formation of as many embryos as there are zygotes. The result is monstrous and abortive development.

Superfetation. Fertilization of an ovum in a uterus already occupied by a product of conception from a previous ovulation. The possibility of superfetation is now pretty generally denied.

Superficial Energy. See CAPILLARITY.

Superflua. Order of the Linnæan class *Syngenesia* (natural family *Compositæ*), having the florets of the disk perfect, but those of the rays only pistillate, as in Tansy and Goldenrod.

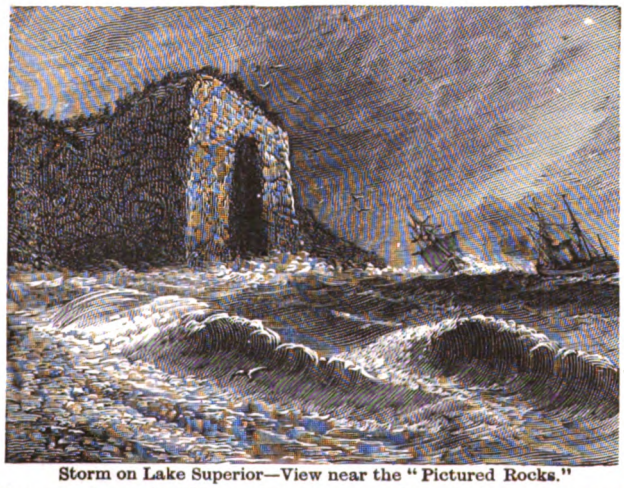
Superheated Steam. Steam at a higher sensible temperature than that which corresponds to its boiling-point at that pressure (see SATURATED STEAM). It is used in engines, so that the heat lost by internal condensation in the cylinder may be supplied from the incoming steam without condensation. The water or mist from such condensation would be re-evaporated when the pressure was lowered by expansion of the steam after cut-off; for such evaporation additional demand for heat is made, which new steam and the hot cylinder walls must supply, and so on at each stroke.

Superintendence, WAGES OF. Amount which the organizer of industrial operations, the entrepreneur, receives over and above the usual rate of interest on the amount of money invested.

Superior. In Botany, ovary of a flower when it is entirely free from and above the calyx.

Superior. Capital of Douglas co., Wis.; at w. end of Lake S.; settled 1855, revived 1881. It has flour and lumber mills, ironworks, and a large trade. Pop., 1890, 11,983, since greatly increased.

Superior, LAKE. Highest and largest of the chain of Great Lakes of N. America, lying between Mich., Wis., Minn. and Canada. Its outlet is by the St. Mary's River to Lake



Storm on Lake Superior—View near the "Pictured Rocks."

Huron. Area 31,200 sq. m., extreme length 412 m., extreme breadth 167 m., maximum depth 1,008 ft., elevation 602 ft., drainage area 85,000 sq. m.

Superior Limit OF INTEGRATION. That toward which the definite integral is reckoned. When the limits are indicated, it is placed at the upper, the inferior at the lower extremity of the sign of integration.

Superior Limit OF ROOTS. Quantity larger than the largest root. The ordinary limit is found by subjecting the largest negative coefficient to the root indicated by the position of the first negative coefficient from the first term: the result increased by one is the superior limit. The least superior limit is found by Sturm's theorem as a basis for approximating to the incommensurable roots.

Superior Planets. Those whose orbits are outside that of the earth: Mars, the Asteroids, Jupiter, Saturn, Uranus, and Neptune.

Supernumerary. Extra men detailed for guard duty, to take the places of those of the regular detail in case any of the latter are found not fit to march on guard.

Supernumerary Buds. Buds in the axils of leaves in addition to the principal one.

Superphosphate. Fertilizers in which the phosphate of lime has been made soluble by treatment with sulphuric acid. In general they give the best results on wheat, oats, and barley, on land that does not contain much lime. On some limestone lands their use seems to be practically without result. See CALCIUM PHOSPHATES.

Supersaturation. Some solutions have a higher coefficient of solubility when hot than when cold. If such a hot saturated solution be carefully cooled, the salt does not immediately crystallize, but the liquid remains in a condition of supersaturation, and is in a state of unstable molecular equilibrium. If a crystal of the same salt be dropped in, the excess held in solution immediately crystallizes.

Suphis, or CHEOPS. Second king of 4th Egyptian dynasty.

Suppé, FRANZ VON, 1820–1895. Composer of German operettas. *Fatinitza*, 1876, *Boccaccio*, 1879, *A Trip to Africa*, 1883, *Bellman*, 1887, and *Clover*, 1888, became popular in English versions in America.

Supper, LORD'S. See EUCHARIST and LORD'S SUPPER.

Supple-Jack. 1. *Berchemia volubilis.* Climbing shrub of the natural family *Rhamneæ*, native of the s.e. U. S. 2. *Paullinia curassavica.* Climbing woody vine of the natural family *Sapindaceæ*, native of tropical America. Its stems are made into walking sticks.

Supplemental Chords. Those drawn from the same point on the curve to the extremities of a diameter. If the ellipse and hyperbola in one of two supplemental chords be parallel to any diameter, the other chord is parallel to the conjugate diameter. Supplemental chords thus determine conjugate diameters.

Supplementary Cost. That portion of the cost of production of any article which consists in its share of the general expenses of the business.

Supplement of an Angle. Remainder obtained by subtracting the given angle from 180°. If the angle exceed 180°, the supplement is negative.

Supply, IN ECONOMICS. Quantity of a given article which can be had at a given price.

Supply and Demand, EQUILIBRIUM OF. Balancing of the desire to acquire new economic goods with the desire to avoid certain efforts, or retain certain immediate enjoyments or other economic goods already possessed.

Supply Price. That required to call forth the exertion necessary for producing any given amount of a commodity.

Supported Joints. System of supporting the ends of rails upon cross-ties, as distinguished from that of suspended joints, where they are between the cross-ties.

Supporting Lamella. Thin lamella between the ectoderm and endoderm in Hydroids.

Suppression, IN BOTANY. See ABORTION.

Suppression of Contraction. Destruction of the contraction on one side of a contracted vein, thus increasing the flow of water.

Suppuration. Termination of inflammation when the pus producing bacteria have found lodgment and have developed. The tissues involved are liquefied and changed into pus. One of the fundamental causes for the great success of modern surgery is the exclusion of these bacteria from wound surfaces and the prevention of suppuration. Lister was a pioneer of antiseptic surgery, and a great deal of its popularity, before its value was incontestably demonstrated, was due to his enthusiastic teaching. See PUS.

Supra-axillary. See SUPERAXILLARY.

Supralapsarianism. Severer form of predestinarian doctrine, ascribing the fall of man and the reprobation of the non-elect, as well as the election of the chosen, to the eternal purpose and decree of God.

Supra-œsophageal Ganglion. Cerebral ganglion or brain of Invertebrates. It lies dorsal to the œsophagus, and is united to the infra- or sub-œsophageal ganglion and ventral nerve chain by nerve fibers, called circum-œsophageal commissures.

Supra-renal Capsule. Flat triangular body, weighing from one to two drms., which covers the top of the kidney, as with a helmet. A cavity in the interior contains a reddish or yellowish fluid. Their function is extremely obscure, but probably concerned in lymphosis. See ADDISON'S DISEASE.

Supremacy Act, JAN. 15, 1535. Henry VIII. of England assumed the style of "Supreme head of the Church of England."

It was repealed 1554, and re-enacted 1559. Many executions followed the denial of the king's supremacy.

Supreme Court. Usually, the court of last resort in the State. See COURT.

Supreme Good. See SUMMUM BONUM.

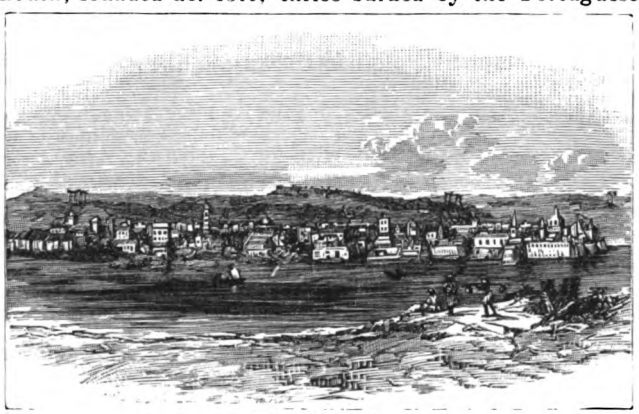
Supreme Rule OF ACTION. Ultimate rule of right and wrong, not with reference to any particular end, but according to an absolute standard.

Surabaya. Seaport on n.e. coast of Java, with a large export trade. Pop., 1890, 107,878.

Suraja Dowlah, d.1757. Nabob of Bengal 1756. He captured and plundered the old fort of Calcutta, June 1756, and shut 146 English prisoners in the Black Hole, where but 23 survived. He was defeated by Clive, Feb. 4, 1757, near Calcutta, and routed at Plassy, June 23. See BLACK HOLE.

Surakarta. Town of central Java; capital of the native prince, who is controlled by the Dutch. Pop., 1890, 91,368.

Surat. City of w. India, on the Tapti, 20 m. from its mouth; founded ab. 1510; thrice burned by the Portuguese;



View of Surat.

commercially important ab.1550–1670; repeatedly pillaged by Mahrattas; partly occupied by English and Dutch from 1612; held by Gt. Britain from 1800. Pop., 1891, 109,229.

Surcouf, ROBERT, 1773–1827. French privateer, long troublesome to the British in the E. Indies.

Surd. Indicated root of a quantity which is not a perfect power of the degree of the root.

Surety. One who has made himself liable for another's undertaking: any change made therein without his consent avoids his liability.

Surface Condensers. See CONDENSER.

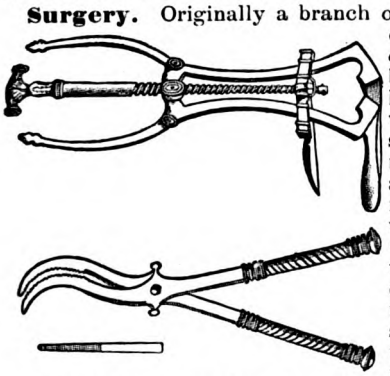
Surface Tension. See CAPILLARITY.

Surf-Bird (APHRIZA). Plover-like bird of the Pacific coast of America.

Surfusion. Condition of a substance when liquid at a temperature below the fusing point. Sodium thiosulphate, *e.g.*, will be in this condition if melted and then carefully allowed to cool without disturbance. If, when cold, a crystal of the salt be brought in contact with the fluid, the mass instantly solidifies with the evolution of heat.

Surgeons, COLLEGE OF. Originated from 1460-61, and after various stages became the Royal Coll. of Surgeons of London in 1800. Its museum is the finest of its kind in Gt. Britain.

Surgery. Originally a branch of medicine involving the employment of manual operations. The term has been widened on the one hand to include more than this, and limited by the specialties on the other, making it difficult to draw a sharp dividing line. It may be considered to be that branch of medicine which takes cognizance of the diseases and accidents of those parts of the body that can be directly inspected, and the operative care of those parts that cannot be. Some writers do not use the term so comprehensively, as they exclude the specialties.



Surgical Instruments from Pompeii.

Surinam. Name given to Dutch Guiana. See GUIANA.

Surinam Toad. See AGLOSSA.

Surplice. White linen vestment worn by clergy during service; modification of the alb; objected to by Continental reformers and English Puritans; now universally used in Anglican and P. E. chancels, and generally by the choir also; used also in R. C. Ch., and in Scandinavia only during the Eucharist.

Surplus Produce OF LAND. Produce in excess of the amount which would have just recompensed the cultivator for his expenditure of labor and capital.

Surprise. In its simplest form, feeling aroused by a sudden, unexpected presentation. It seems to depend on a lack of harmony between the presentation and the expectant attention. This produces apparently a sort of mental shock, in its essence disagreeable. The characteristic facial expression of surprise, viz., intensified attention, is a preservative reaction, whose function is to obtain a clearer presentation of the object causing the feeling. Should the object continue strange and unrecognized, the feeling passes into wonder, which is a state much more intellectual and complex.

Surrey, EARL OF. See HOWARD, HENRY.

Surrogate. Originally, substitute of a bishop in his judicial capacity; in the U. S., local officer who exercises probate jurisdiction.

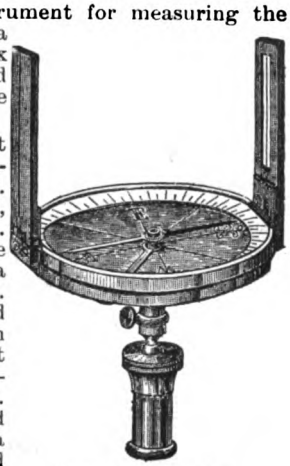
Surtees, ROBERT, 1779–1834. English antiquarian. *County of Durham*, 4 vols., 1816–40. The S. Society, established 1834, publishes similar works.

Survey, BOARD OF. Purely advisory board, comprising generally three military officers, called by the commanding officer of a military post for the purpose of ascertaining and reporting facts, submitting opinions, and making recommendations upon questions of responsibility which may arise through accident, mistake or neglect.

Surveying. See LAND SURVEYING.

Surveyor's Chain. See CHAIN and GUNTER'S CHAIN.

Surveyor's Compass. Instrument for measuring the bearings of lines; consisting of a magnetic needle mounted in a box with sights, the bearings being read off on the graduated circle. See TRANSIT.



Surveyor's Compass.

Surveys, GEOLOGICAL. The first State to provide for the investigation of its rock formations was N. C. in 1823, followed by Mass. in 1830, and by 1895 nearly all the States. Pa. made a second, more elaborate survey. In Ala., N. J. and Ohio a permanent survey is maintained. The U. S. government instituted geological examinations early in its history, and from 1834 has sent expeditions into the Western country for that purpose. The U. S. Geological Survey was established 1879; the British in 1832, Canada 1842, Austria and Spain 1849, and other countries later.

Survival of the Fittest. See NATURAL SELECTION.

Survivorship. Whether A outlives B is to be established, under English law, by evidence, and not by presumptions based on age, sex, or physical strength. If the survivor is joint-owner or obligor with the deceased, he becomes sole owner or obligor at common law. This doctrine has been largely swept away by equity, commercial usage, and statute.

Surya. God of the Sun, in Vedic pantheon; called Savitar and Aditya. According to the myth, he traverses the world with a sunflower in his hand, in a chariot drawn by seven red horses, and produces light and heat. His charioteer is Aruna, god of the dawn, who has no legs.

Susa. Ancient capital of Elam or Susiana, the Khusistan of modern Persia. Important excavations have been made here by Loftus and by Dieulafoy. To the latter is due the discovery of important friezes in colored tiles, now in the Louvre. One of these is a unique representation of a procession of Persian archers.

Susanna. Jewish matron, heroine of a brief apocryphal book, which recounts the attempt against her virtue by two elders, their rebuff, their revengeful impeachment of her chastity, and their detection by the youthful Daniel. The R. C. Ch. gives it as the 13th chapter of Daniel.

Susemihl, FRANZ, b.1826. Prof. Greifswald 1856; writer on Plato and Aristotle. *Hist. Greek Literature in the Alexandrian Age*, 1891.

Suso, or **von Berg,** HEINRICH, 1295–1366. Dominican

monk, mystical preacher and writer. *Book of Eternal Wisdom*, tr. 1500.

Suspended. In Botany, ovules which hang down from top of ovary.

Suspended Animation. Temporary cessation of some of the functions of life. See ASPHYXIA and HIBERNATION.

Suspended Joints. Joints of railroad rails placed between the cross-ties, as distinguished from those placed upon the cross-ties.

Suspender. Rod which hangs from the cable of a suspension bridge, and to whose lower end the roadway is attached.

Suspension Bridge. See BRIDGES, BROOKLYN BRIDGE, and NIAGARA BRIDGES.

Suspensor. See PROEMBRYO.

Susquehanna. River, chiefly of Pa. The e. or n. branch rises in Otsego co., N. Y., and flows some 300 m. s.w. then w. through N. Y., then s.e. and again s.w. through Pa. to Northumberland, where it joins the w. branch, which rises in Cambria co. and flows ab. 200 m. e. and then s. The united

Susquehanna—Junction of West and North Branch.

stream flows s. till joined by the Juniata, and then s.e. to Md. and Chesapeake Bay, ab. 150 m. It is not navigable, except for timber-rafts, etc., in spring, but is noted for beauty of scenery, especially in the Wyoming Valley, which is celebrated in history, legend, and poetry. Drainage area ab. 28,000 sq.m.

Sussex. Saxon kingdom in s. England, founded 477 by Ella; subject to Wessex 725.

Sussex. See CATTLE.

Sustermans, JUSTUS, 1597–1681. Flemish portrait painter, affiliated with Rubens and Van Dyck, but ranking much below them.

Sutcliffe, MATTHEW, ab. 1550–1629. Dean of Exeter 1588; controversial writer, chiefly in Latin.

Sutech. Egyptian deity, in later times identical with Set, and regarded as the god of foreigners.

Sutlej. Branch of the Indus, rising in Thibet, and flowing nearly 1,000 m. n.w., w., and s.w.; joined by four other rivers. See HYPHASIS.

Sutlers. See CAMP FOLLOWERS.

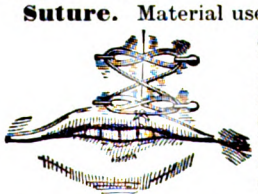
Sutras. Collections of Hindu aphorisms, partly commentaries on the Vedas.

Sutro, ADOLF HENRY JOSEPH, b.1830 in Prussia. Mining engineer in Cal. and Nev.; promotor of the tunnel, 1869–79, to reach the Comstock lode. He gave to San Francisco a copy of the Bartholdi statue of *Liberty*, 1887.

Suttee. Voluntary cremation of a widow on her husband's funeral pyre; practice once prevalent among the Hindus, but suppressed by the British 1829, and in the native States under their protection 1847.

Sutter, JOHN AUGUSTUS, 1803–1880. Swiss pioneer in Cal. 1839, at what is now Sacramento; useful to the Wilkes and Fremont expeditions; ruined by the discovery of gold 1848 on his premises.

Suture. Material used by the surgeon to stitch wounds together. It may be made of metallic wire (usually silver), of silk, of animal membrane (catgut), etc. The name is also applied to the character of the stitch employed, as a continuous or interrupted suture.—In Anatomy, the immovable articulations of the bones of the cranium.



Twisted Suture as used in the operation for harelip.

Sutures. In Botany, line along which the infolded edges of the carpellary leaf meet, in the metamorphosis of the pistil of a flower; also line opposite this, corresponding to the midrib of the leaf.

Sutures. 1. Lines where two structures, *e.g.*, bones, join, without forming a movable articulation. 2. Lines on the outside of the cephalopod shell, made by the margins of the septa.

Suwanee. River rising in s. Georgia in Okefinokee Swamp, flowing s. through Florida into the Gulf of Mexico, ab. 10 m. n. of Cedar Keys; it has been made navigable to White Springs.

Suwarow, or **Suvorof,** ALEXANDER, 1729–1800. Russian general, active against the Turks, Poles, and French; eminent especially for his captures of Ismail, 1790, and Praga, 1794.

Suzerain. Prince or chief in relation to his vassals; now, state or ruler holding nominal authority over another state.

Svanetia. District of the Caucasus. Area 1,250 sq. m., pop. ab. 13,000.

Svastika. Symbol found on ancient coins and monuments in Europe and Asia; supposed to refer to sun worship.

Svatopluk, or ZWENTIBOLD, ab.884. Ruler of Moravia.

Svendsen, JOHANN SEVERIN, b.1840. Norwegian musician, violinist and composer; conductor at Christiania 1872–77; Court Chapelmaster at Copenhagen since 1873. His compositions are chiefly chamber music and orchestral pieces.

Sven Tröst. Pen-name of SNOILSKY (q.v.).

Svetla, KAROLINA (JOHANNA MUZAK), b.1836. Bohemian novelist and poet.

Svir. River of n.w. Russia, flowing from Lake Onega, 135 m., into Lake Ladoga, making part of the Marûnsk system of navigation, connecting the Baltic with the Caspian and White Seas.

Svold. On coast of Pomerania; scene of defeat of Olaf Trygvasson, King of Norway, by Svend of Denmark, 1000.

Swabia. See SUABIA.

Swain, CHARLES, 1803–1874. English poet. Known as the "Manchester" poet.

Swain, DAVID LOWRY, LL.D., 1801–1868. Gov. of N. C. 1832–35; pres. Univ. N. C. from 1835.

Swain, GEORGE FILLMORE, b.1857. Prof. of Civil Engineering in Mass. Institute of Technology since 1883; engineer of the Mass. Railroad Commission.

Swain, JOSEPH, 1761–1796. English hymnist.

Swainson, WILLIAM, 1789–1855. English writer on ornithology and zoölogy, in New Zealand from 1841. *Naturalist's Guide*, 1840.

Swallowing. Act by which food or other material is conveyed from the mouth to the stomach. It is placed at the back of the mouth by voluntary action, where it excites a reflex movement by which it is carried down the œsophagus by peristaltic action.

Swallows (HIRUNDINIDÆ). Picarian birds with long pointed wings, small feet, short broad bill, deep gape without bristles, 9 primaries in wing, and 10 tail feathers. Ab.100 species are

European Barn Swallow (*Chelidon rustica*) and European Martin (*Hirundo urbica*).

known, almost universal in distribution. They feed while flying, catching insects. Some build nests in crevices, some dig holes in banks, and others make mud nests plastered against walls. *Chelidon erythrogaster*, the Barn Swallow of the U.

S., much like that of Europe, is lustrous steel blue, pale chestnut below, tail deeply forked. It arrives early in May and remains in n. U. S. until late August. The American Chimney Swallow is a SWIFT (q.v.). See FISSIROSTRES.

Swamp Oak. In Australia, *Casuarina suberosa*, a tree of the natural family *Casuarineæ*, producing very hard wood; in N. America, *Quercus palustris*.

Swan, JOSEPH ROCKWELL, 1802–1884. Judge Ohio Supreme Court 1854–59. *Statutes of Ohio*, 1841; *Pleading and Practice*, 1851.

Swanee River. See SUWANEE.

Swan Maidens. Widely diffused European tale, traced to the ancient Hindu cosmic myth of the Apsaras, personifications of the cirrus clouds. They were the houris of the Vedic heaven, receiving the souls of the heroes. The common tale is that of the man who surprised several maidens bathing. He seizes the swan robes of one which lie nearest him and makes her his wife. She usually escapes by recovering her feather robe.

Swann, THOMAS, 1805–1883. Pres. Baltimore and Ohio R.R. 1847–53; Mayor of Baltimore 1856–60; Gov. of Md. 1865–68; M.C. 1869–79.

Swans. Large duck-like birds with long necks, distributed throughout n. and s. temperate latitudes, but extinct in Africa. The color is a brilliant white, except in *Chenopis atrata* of Australia, which is black, but with white bars on wing and bill, and in the black-necked swan of S. America. The latter nests in July or Sept., building up from the bottom in water several feet deep. The Trumpeter Swan (*Cygnus buccinator*), of N. America, has the bill wholly black; the Whistling Swan

Mourning Swan (*Chenopis atrata*).

has a black bill, yellow at base. *C. olor*, the Mute Swan of Europe (now native to, but once introduced into England), is largely domesticated; it has red bill and black legs. The wild forms migrate s. to the Mediterranean, Egypt, and Persia. The young (cygnets) are sooty gray or brown, and do not become pure white for a year, but occasionally white cygnets are hatched from this species. Cygnets are a table delicacy in Europe. See ANATIDÆ.

Swansea. Seaport in s. Wales; seaside resort. It has large commerce, shipping tin, copper, iron, and coal. Pop., 1891, 90,423.

Swarm-Spores. See ZOÖSPORES.

Swarthmore College. In Delaware co., Pa.; founded 1864, opened 1869; controlled by Friends. It has (1897) 24 instructors and 172 students, of both sexes. It offers courses in arts, letters, science, and engineering.

Swartz, OLAF, 1760–1817. Prof. Stockholm. *Observationes botanicæ*, 1791; *Flora Indiæ occidentalis*, 1797–1806; *Synopsis Filicum*, 1806; *Lichenes Americani*, 1811.

Swastika. See SVASTIKA.

Swatow. Seaport of China, opened 1859; on the Hanu, near its mouth, 225 m. e. of Canton. Its chief exports are tea and sugar. Pop. ab.25,000.

Sway Bracing. Bracing used in a bridge for the purpose of preventing oscillations and stresses in case of wind.

Swayne, NOAH HAYNES, LL.D., 1804–1884. Justice U. S. Supreme Court 1862–81.—His son, JOHN WAGER, b.1834, was Major-gen. U. S. Vols. 1865–67.

Sweat. See PERSPIRATION.

Sweating Sickness, or MILIARY FEVER. Epidemic which visited England 1485, 1506, 1517, 1528, and 1551. It began with pains in various parts of the body, flushes of heat and sleepiness, followed by profuse sweating, and sometimes an eruption. The crisis usually passed in 24 to 48 hours, and the epidemic generally spent itself in a month. Its causes have been sought in unfavorable atmospheric conditions, lack of house and street drainage, unsanitary habits, and overfeeding.

Sweating System. Organization of labor existing in some industries, in which the employer gives out the work to a subcontractor, who in turn employs workmen, generally in his own rooms. It has invariably proved subject to abuse.

Sweden. Country of n. Europe, occupying with Norway the Scandinavian peninsula, and comprising most of its e. incline. Area 172,876.5 sq. m. Agriculture is the principal

Types and Costumes—Swedish Interior.

industry. It produces large amounts of iron and coal, and its forests are of great value. Manufactures are of secondary importance. It has a large commerce, 5,454 m. of railway, and an excellent public school system. The government is a limited monarchy. The capital is Stockholm. Norway and Sweden are united under one king, and act in their foreign affairs as a unit. Sweden was Christianized ab.1150, united with Denmark and Norway 1397–1524, and for near two centuries prominent in European affairs, especially under Gustavus Adolphus, 1611–32. The wars of Charles XII., 1697–1718, exhausted his realm, which ceased to be a first-class power. The present dynasty began with Charles XIV., Bernadotte 1809–18. Pop., 1890, 4,784,675, ab.28 to a sq. m.

Sweden, CHURCH OF. Branch of Lutheranism, governed by bishops, the metropolitan being the Abp. of Upsala. Its Episcopal succession is doubtful, and not held as of divine right.

Swedenborg, EMANUEL, 1688–1772. Swedish theosopher, founder of a profound and peculiar religious system, now widely

Emanuel Swedenborg.

diffused, and partially embodied in the NEW JERUSALEM CHURCH (q.v.). He was assessor of mines 1716–47, was ennobled 1719,

gained high scientific rank, and began to teach his system 1743. He was subject to visions, dreams, and strange psychologic experiences, which he interpreted as revelations. *Opera Philosophica et Mineralia*, 3 vols., 1734; *Animal Kingdom*, 5 vols., 1741–45; *Arcana Celestia*, 8 vols., 1749–56; *Heaven and Hell*, 1758; *Doctrines of the New Jerusalem*, 1763; *Angelic Wisdom*, 1764; *Conjugal Love*, 1768; *True Christian Religion*, 1771. His works were reprinted in 10 folio vols. 1869–70; most of them exist in English versions.

Swedish Green. See SCHEELE'S GREEN.

Swedish Language. Member of the Scandinavian family, closely allied to Danish, with which it made up the so-called East-Norse group, as opposed to the Norwegian (now represented only in dialects) and Icelandic. The literature of modern Swedish begins with the Reformation.

Swedish Literature. The Scandinavian literatures have much in common. In early times Sweden produced poetry similar to that of the other members of the group. In Mediæval times the writings were largely theological; the first Swedish work of importance was a paraphrase of the Bible by ST. BIRGITTA (q.v.) ab.1340. The oldest history is *Chronica Regni Gothorum*, by Ericus Olai (d.1486). In the 14th century the native literature of Norway became extinct, and that of Sweden increased, chiefly in rhyming chronicles, ballads and law compilations. In the Reformation in the 16th century the N. T. was translated by Laurentius Petri, and his brother, Olaus, wrote the first Swedish hymnal. The latter also wrote the earliest school drama, *Tobiæ Comodia*, 1550. Johan Messenius wrote six plays illustrating Swedish history. Under Gustavus Adolphus and his successors literature improved, philosophy and science were cultivated, and noted scholars invited to the country. The Swedish Academy was founded 1786. Bellman, Kellgren, Leopold, Thorild, Rosenstein and Adlerbeth are among the writers of this period, much under French influence. In science there were Linnæus, Celsius, Bergmann, Scheele and Swedenborg. In the present century the influence of the German romantic school has been great in all directions, poetry, the drama, philosophy and fiction. Runeberg, Oscar II., Frederika Bremer, Rydberg and Mellin are representatives of this period. In science are Retzius, Fries, Berzelius and Nordenskiöld. See SCANDINAVIAN LITERATURE.

Sweeny, THOMAS WILLIAM, U.S.A., 1820–1892. Brig.-gen. U. S. Vols. 1862–65; distinguished in Mo., at Shiloh, and in the Atlanta campaign.

Sweep. Long oar used on board ship to assist the rudder, during a calm, or the motion of the ship, as in the ancient galley.

Sweeping Table. Ore-dressing apparatus on which slimes are gently manipulated with a broom while a flowing current of water carries away the lighter and poorer portions.

Sweepstakes. Mode of gambling, especially at races. Tickets in a pool are sold for certain horses, the proceeds of which, less a certain percentage for the manager of the pool, is divided among those who bought tickets on the winning horse. The Pari Mutuel, the pool for the race for the Grand Prix at Paris, has paid 800 for 1. Pools are sold also for second and third place in the race.

Sweet, BENJAMIN JEFFREY, 1832–1874. Brig.-gen. U. S. Vols. 1864–65; commander of Camp Douglas, which he twice saved, with Chicago, from Confederate attacks.

Sweet, HENRY, b.1845. English philologist. *Phonetics*, 1877; *Current Shorthand*, 1892.

Sweet, JOHN EDSON, b.1832. American machinist, inventor of a straight-line engine.

Sweetbread. Pancreas of animals; that of ruminating animals is used as food.

Sweet-Brier. *Rosa rubiginosa.* Tall, climbing, odorous shrub of the Rose family, native of Europe, cultivated and introduced into N. America.

Sweet-Cicely. 1. Herbs of the genus *Washingtonia*, natural family *Umbelliferæ*, natives of the n. temperate zone. The roots are aromatic, with flavor of anise. 2. *Myrrhis odorata*, similar plant of the same family, native of Europe.

Sweet-Fern. *Comptonia peregrina.* Fragrant shrub of the natural family *Myricaceæ*, native of e. N. America.

Sweet-Flag. See CALAMUS.

Sweet-Gale. *Myrica gale.* Small shrub of the natural family *Myricaceæ*, native of the cooler portions of the n. hemisphere, growing in swampy places.

Sweet-Leaf. *Symplocos tinctoria.* Small tree of the natural family *Styracaceæ*, native of the s.e. U. S. Known as Horse Sugar.

Sweet Potato. *Ipomœa batatas.* Trailing vine of the natural family *Convolvulaceæ*, bearing thick fleshy edible roots; widely cultivated for food.

Sweet Potato (*Ipomœa batatas*).

Sweet-Sop. *Anona squamosa.* Tree of the natural family *Anonaceæ*, native of tropical America; cultivated for its edible fruit.

Sweet Spirits of Niter. See ETHYL NITRITE.

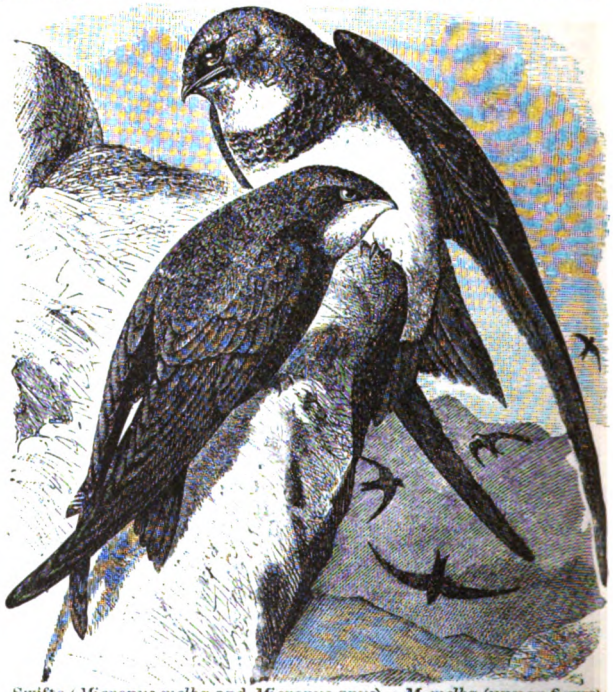
Sweet William, WILD. *Phlox maculata.* Showy-flowered herb of the natural family *Polemoniaceæ*, native of the e. U.S.

Swell of Muzzle. In the old bronze and cast-iron cannon that portion of the gun near the muzzle which was made of greater thickness than the portion a few calibers in rear. Modern guns do not have it.

Swetchine, ANNE SOPHIE (SOYMANOF), 1782–1857. Russian-French writer, m. 1799: maintainer of a noted salon in Paris from 1816. *Letters*, 1861, tr. 1867; *Writings*, tr. 1869.

Sweyn, or SVEN, d.1014. King of Denmark; father of Canute; invader of England 1003 and 1013.

Swift. 1. Fence-lizard. 2. More properly, 60 species of Picarian birds, of the family *Micropodidæ* or *Cypselidæ*, with long wings, rapid flight, crepuscular, short and wide bill, and deep gape. In these respects they resemble swallows, but they differ in having 10 primaries, 6 or 7 secondaries and 12 rectrices, and in being Picarian. Not all the family are "true" swifts. The latter have all four toes turned forward, and never more than 3 phalanges in any toe. Some build remarkable, pendent nests,



Swifts (*Micropus melba* and *Micropus apus*). *M melba* (upper figure) is Alpine Swift, *M. apus* (lower figure) is European Swift.

attached to walls and roofs and glued together with glutinous saliva. Among the other members of the family is *Chætura pelagica*, the Chimney Swallow (Swift), with its spine-pointed tail feathers, and the Swiftlets, among which the *Collocalia* species makes the edible birds' nests of almost pure mucus: one cave in n. Borneo yields three crops per year. 40 nests bring $9, and $25,000 worth are taken here annually. See FISSIROSTRES, CYPSELI, and PAMPRODACTYLOUS.

Swift, JONATHAN, 1667–1745. Irish satirist, long a power in British politics; Dean of St. Patrick's, Dublin, 1713; famous for genius, misanthropy, and disappointed ambition. His strange relations to "Stella" (Esther Johnson) and "Vanessa" (Esther Vanhomrigh), and his lamentable fate, are still matters of general interest. Besides many tracts and much rough but vigorous verse, he wrote *A Tale of a Tub* and *Battle of the Books*, 1697–1704; *Conduct of the Allies*, 1711; *Journal to Stella*, 1713; *Drapier's Letters*, 1724; and the immortal *Gulliver's Travels*, 1726. His mind gave way 1741.

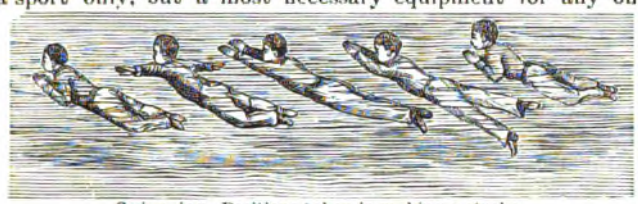
Swift, LEWIS, b.1820. Director of an observatory at Rochester, N.Y.; discoverer of several comets.

Swift, WILLIAM HENRY, U.S.A., 1800–1879. Engineer, long on the coast survey, and later in railroad work.—His brother, JOSEPH GARDNER, U.S.A., 1783–1865, was similarly employed.

Swift, ZEPHANIAH, LL.D., 1759–1823. M.C. 1793–97; Judge Conn. Supreme Court 1801; Chief-justice 1806–19. *Laws of Conn.*, 1795–96; *Law of Evidence*, 1810; *Digest of Conn. Laws*, 1822–23.

Swimmerets (PLEOPODS). Flat or leaf-like exopodites and endopodites of the abdominal appendages of lobster-like *Crustacea;* particularly those of the last joint, which are greatly enlarged, and, with the telson, form the tail fin of these animals.

Swimming. Art of keeping the body afloat in water and propelling the person in any desired direction; properly not a sport only, but a most necessary equipment for any one



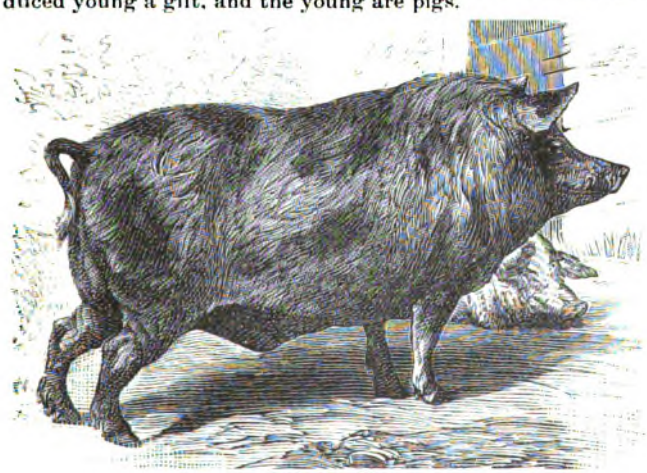
Swimming—Positions taken in making a stroke.

whose time is spent on or near the water. The sport includes diving and swimming under water. The most remarkable modern swimmers have been Capt. M. Webb, who in Aug. 1875 swum from Dover to Calais in 21 h. 45 min., and the Beckwiths, all of England. 100 yards in still water has been swum in one minute by Meadham of New S. Wales, 440 yards in 5 min. 49¼ sec. by Tyers of England, and a half mile in 12 min. 7½ sec. by Nuttal, an English professional. Beckwith, swimming 10 h. a day for six days, covered 94 m.; Miss Beckwith swum 20 m. in the Thames in 6 h. 25 min. P. S. McNally of Boston in July 1897 swum 35 m., nearly across the English Channel, in 15 h.

Swinburne, ALGERNON CHARLES, b.1837. English lyric and dramatic poet, noted for his unequaled mastery of melodious verse, and in early life for his radical opinions and the extreme freedom of his muse. These qualities are most apparent in *Laus Veneris*, 1866, and *Songs before Sunrise*, 1871. *Atalanta in Calydon*, 1864, is his best dramatic poem. He has also pub. *Essays and Studies*, 1875, a *Life of Victor Hugo*, 1886, and other critical prose.

Swine (SUIDÆ). The native pig of the New World is the Peccary; others have been introduced. The domestic pig, *Sus scrofa*, is descended from the European wild boar, but with admixture of a stock long bred in e. Asia. The boar's canines of both jaws turn upward, and are used in digging for food, as well as for defense. Wild swine are swift runners. They rut in the fall. The gestation period is 4 months, the young, which are striped, are hidden and well-defended by the mother. A number of species live in the E. Indies; others are the Bosch Vark in S. Africa and the Red River pig of Guinea. See WART HOG.

Swine are kept but for one purpose, meat; consequently all the breeds approach one type of form, that most profitable for meat production. Breeds differ mainly in size, color, and minor points. An adult male is a boar, a castrated male a barrow, an adult female a sow, a female that has not produced young a gilt, and the young are pigs.



Berkshire Pig.

Berkshire.—Breed that originated in Berkshire, Eng. They are of medium size, symmetrical form, black, with a strip in the face, the four feet, and a few hairs at the tip of the tail, white. They have a dished face and erect ears. Next to Poland China in numbers, they are much esteemed for the high quality of the bacon and hams they furnish.

Cheshire.—White breed resembling the Chester White; chiefly known in a few counties in central N. Y.

Chester White.—Large white breed, originating in Chester co., Pa. They are the largest and most popular of the white breeds. No black hair is admissible, but bluish spots in the skin are not a disqualification.

Duroc-Jersey.—American breed, characterized by large size and a red or reddish brown color. They are somewhat coarse in body, and are held in less esteem on that account. They are hardy and prolific.

Essex.—Small black English breed. They make a very good quality of pork, but are too small to enter into competition with the improved American breeds.

Poland China.—Breed that originated in central Ohio, by crossing, selection, and inbreeding. They are of large size, formerly largely spotted, but now nearly entirely black, and very smooth and symmetrical, with a slightly dished face and drooping ears. They far outnumber any other breed.

Suffolk.—Small white English breed. They have scanty hair and tender skins, rendering them liable to scurvy and other skin diseases, on which account they are little kept.

Victoria.—White breed of composite origin. There are claimed to be two different breeds; and one of them at least has not well-fixed characteristics. They are kept only in small numbers.

Yorkshire.—Small white breed of English origin, chiefly characterized by their short and very much dished faces. They

Improved Yorkshire Pigs.

mature early, fatten readily, and are much prized where a small carcass is desired for cutting up fresh. See PORK.

Swine-Cress. See WART-CRESS.

Swing. Common means of amusement in Asia, as well as Europe and America. In Corea, swinging is a spring sport and is practiced by girls even of 18 and 19 years. In Japan, men and boys swing, both the swing and the act of swinging being called Buranko.

Swing, CAPTAIN. Name assumed by certain persons in England between 1830–33, who sent threatening letters to those who used threshing-machines. Disregard to these demands resulted in the burning of grain-stacks and farm buildings. The laboring class believed that the use of machinery would lessen the demand for labor.

Swing, DAVID, 1830–1894. Prof. Miami Univ., Ohio. 1854–66; Presb. pastor in Chicago from 1866; independent from 1874, after a trial for heresy, of which he was acquitted. His influence was great. *Club Essays*, 1880.

Swing Bridge. One which swings on a central pivot. See BRIDGES and DRAWBRIDGE.

Swinton, WILLIAM, 1833–1892. Scottish-American writer of school-books and histories of the Civil War; prof. Univ. Cal. 1869–74. *Rambles Among Words*, 1859; *Word Analysis*, 1872. —His brother, JOHN, b.1830, is a journalist and radical lecturer.

Swiss Guards. In the French service from 1616; famous for fidelity and heroism; nearly annihilated in defending the Tuileries Aug. 10, 1792; in 1830 defeated and dispersed. The Pope employs Swiss Guards about his palace.

Swisshelm, JANE GREY (CANNON), 1815–1884. American journalist and anti-slavery agitator. *Half a Century*, 1881.

Switch. Arrangement of levers and movable rails,

whereby a train may be turned from one track upon another. The principal types are the STUB, SPLIT, and WHARTON SWITCHES (q.v.).

Switchback Railway. One in a mountainous country, so arranged that after a down grade the train runs by its momentum up a short grade, and then backward by gravity on another track; also, road where a car is drawn up an inclined plane, and then runs back in a circuit to the point of starting. The oldest in the U. S. is that at Mauch Chunk, Pa., built 1845 for coal transportation.

Switch-Grass. See QUACK-GRASS.

Swithin, ST., d.862. Bp. of Winchester 852; canonized 970. His bones were removed to the cathedral 971, and were supposed to work miracles.

Switzerland. Republic of Europe, between Italy, France, and Baden; of irregular shape; area 15,964 sq. m. Its surface consists mainly of an alternation of high, rugged mountains (the Alps) and narrow valleys. Its agricultural industries are extensive and varied. The manufactures are also large and varied, consisting largely of silk, cotton, watches, and condensed milk. Its railway mileage in 1893 was 2,220. Its early history is one of heroism, as shown in the compact of Uri, Schwyz, and Unterwalden 1307, and the legendary deeds of WM. TELL (q.v.). The Austrians were defeated at Morgarten 1315, at Sempach 1386, and at Næfels 1388. Lucerne joined the alliance 1332. The Helvetic Confederation was founded 1352 by eight Cantons. Independence was secured 1477 by the destruction of Charles the Bold. Five more Cantons were added 1513. Zurich was defeated by R. C. Cantons 1531. By the treaty of Westphalia (1648), S. was acknowledged as an independent State, and again, at the peace of 1815. A Helvetic Republic existed 1799–1803; French influence prevailed till 1814.

Lake Kloenthal, Switzerland.

The confederation consists of 22 Cantons, each represented in the Diet. The constitution was modified 1830, 1848, and 1874. The Cantons are divided into absolute and representative democracies. In the former, legislation is conducted by a yearly assembly of the adult male population; in the latter, by a great council, elected by the people. The control of the army, foreign affairs, police, post-office, settlement of disputes between Cantons, are handed over to a Federal Assembly of two Chambers, the State Council of 44 members, and the National, of 135. Executive power is delegated to a Federal Council of 7, holding office for 3 years, the President being merely one of the Council. The Federal Tribune, of 9 members, elected by the Federal Assembly, acts as a high court of appeal. Every citizen is obliged to serve as soldier; there is no standing army. Property is much subdivided, and there are no titles of Swiss origin. Systems of law differ in the different Cantons. Mountains and lakes produce the finest scenery, and make S. "the playground of Europe," and the resort of multitudes of summer visitors from all parts of the world: hotel-keeping is a leading and increasing industry. The chief cities are Zurich, Geneva, Basel, and Berne. Pop., 1894, 2,986,848.

Sword. Hand weapon used in all lands and ages, except by savages; of varying size and shape; in the past sometimes, but rarely, two-handed; sometimes curved, as the saber, but usually straight; formed for either cutting or thrusting, or for both. The edge may be single, or double, as in the Highland claymore. The hilt or handle has been variously formed, often elaborately decorated, and sometimes of basket pattern. It embraces the rapier, cutlass, broadsword, scimiter and saber. It is the official weapon of the commissioned officer and the symbol of his authority, of which he is temporarily deprived when placed in arrest.

Sword Bayonet. Bayonet shaped like a short broad sword, now used with the new service .30 caliber rifle. When detached from the rifle it may be used as a cutting implement.

Sword Dance. Dancing with swords is a ceremonial custom of great antiquity, and took the form either of a practical military exercise, in which it existed in n. Europe to a late time, or as a dramatic exhibition by youths or girls, such as the Pyrrhic dance of the Greeks and Romans. A sword dance by singing girls is a popular amusement of the gentry of Corea. In Scotland the person dances over two swords crossed upon the ground or floor.

Swordfish. See ACANTHOPTERI and XIPHIAS.

Syagrius. Ruler of the kingdom of Syagrius, between the Seine, Marne and Oise in France. Defeated by the Franks under Clovis at Soissons 486, by whom he was put to death. He was the last Roman ruler in Gaul.

Sybaris. Greek town in Lucania, on or near Gulf of Tarentum; founded ab. 720 B.C.; famous for luxury; taken and destroyed 510 B.C. by Crotonians, and a river turned on its site.

Sybel, HEINRICH VON, 1817–1895. German historian; prof. Bonn 1841 and 1861, Marburg 1846, and Munich 1856; member of several parliaments; director of archives at Berlin 1875; founder and ed. *Hist. Zeitschrift. Deutschen Königthums,* 1844; *Revolutionszeit, 1789–1800,* 5 vols., 1853–74: *Establishment of the German Empire,* 5 vols., 1885–90, tr. 1891.

Sycamine. In Scripture, the black mulberry tree.

Sycamore. *Ficus sycomorus.* Tree of the Fig family, native of the Mediterranean region. In Scripture, species of fig, with leaves slightly resembling the mulberry. The wood was light and porous, but lasted for very many ages.

Branch of *Ficus sycomorus*: *a*, fruit.

Sycamore, AMERICAN. See BUTTONWOOD.

Sycandra. Calcareous sponge, one of the Sycones. See SYCONIDÆ.

Syconidæ (SYCONES). Calcareous sponges, rarely colonial, with thick walls, pierced by straight radial tubes that project on the surface. The body is sac-like, opening by one osculum. The flagellated cells are confined to dilatations of the radial canals. *Sycandra* is an example.

Syconium. Fig-fruit. It consists of a hollow flower-stalk or receptacle, within which a large number of minute flowers are borne, some of which ripen small achenes, often considered the seeds, the structure becoming fleshy and edible. It is also called a Hypanthodium.

Sycon-Type. Sponge having simple or branched lateral or radial tubes, coming off from the paragaster and involving the entire body wall, or simply burrowing in a thick mesoderm. In this type, the endoderm cells are of two sorts, pavement cells and choanocytes; the latter are restricted to the radiating tubes.

Sycosis. Name given to various diseases of the hair follicles. Barber's itch, a contagious disease, is sometimes so called. True sycosis is non-parasitic and, consequently, not communicable.

Sydenham. In Kent, 8 m. s. of London; site of the Crystal Palace, built 1852–54, at a cost of ab. $7,000,000.

Sydenham, CHARLES EDWARD POULETT THOMSON, 1799–1841. M.P. 1826; Privy Councilor 1830; Gov.-gen. of Canada 1839; Baron 1840.

Sydenham, FLOYER, 1710–1787. English translator of Plato, 1760. *Onomasticon,* 1784.

Sydenham, THOMAS, M.D., 1624–1689. London practitioner, who introduced a method, then unfamiliar, ascribed to Hippocrates. His Latin works were collected and published as their first issue 1846 by the S. Society (formed 1843), and tr. 1848. This society prints medical works.

Sydney. Capital of New South Wales, Australia, on the shore of Port Jackson, an inlet which furnishes a fine harbor; founded 1788, but mainly of recent growth; long a penal settlement. It is in a coal region, and has a mint, a large commerce, and considerable manufactures. Its university dates from 1852. Pop. 1891, 112,000; with suburbs, 380,000.

Sydney Town Hall.

Sydney, ALGERNON. See SIDNEY.

Syenite. Crystalline rock consisting of feldspar and hornblende, with or without quartz, resembling granite in its mode of occurrence, but less common. The name was first given by Pliny to rock from Syene in Egypt, a hornblendic granite, and later by Werner to the rock from the Plauensche Grund near Dresden, which was mainly a mixture of hornblende and feldspar.

Sykes, GEORGE, U.S.A., 1822–1880. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862–66; commander 5th corps at Gettysburg.

Sylburg, FRIEDRICH, 1536–1596. Librarian at Heidelberg; editor of sundry classics.

Sylla. See SULLA.

Syllabus. Encyclical of Pope Pius IX., Dec. 8, 1864, condemning eighty tenets, about half of which are condemned by Christians generally, while the others are regarded by most Protestants as true. Whether it is of dogmatic or only of disciplinary authority does not appear to be finally settled.

Syllogism. Form of mediate inference which consists of three terms and three propositions, major, minor and middle terms, major and minor premises, and conclusion. The conclusion is based upon the comparison, in the premises, of the major and minor with the middle term.

Sylphs. In mediæval legend, spirits of the air, as gnomes are of earth and salamanders of fire.

Sylva. Botany of the trees of a country.

Sylvanite. $(Au,Ag)Te_2$. Rich gold and silver telluride, formerly found in considerable quantity in Transylvania, but in recent years regarded as a very rare mineral, until the discovery of the Cripple Creek deposits in Col., where it is now one of the most important of the ores.

Sylvester I., ST. Bp. of Rome 314–335. His day is Dec. 31.—II. GERBERT, ab.950–1003. Abbot of Bobbio ab.990, Abp. of Ravenna 998. Pope 999. As a man of learning, some supposed him to be in league with the devil.—III. Antipope 1046.

Sylvester, JAMES JOSEPH, LL.D., D.C.L., F.R.S., b.1814. English mathematician. Prof. of Mathematics, Univ. Va., 1841–42, of Physics, London 1851, Woolwich 1855, and Johns Hopkins Univ. 1876; Prof. of Geometry at Oxford 1883; leader in modern analysis, especially in the advanced development of determinants.

Sylvester, JOSHUA, 1563–1618. English poet. His version of Du Bartas' *Divine Weeks and Works*, 1605, was a folio of over 1,000 pages. *Tobacco Battered*, 1615.

Sylviculture. See FORESTRY.

Sylvie, EDUARD, 1670–1739. French naturalist, in S. America and W. Indies 1701–10. *Voyages*, 10 vols., 1714–28.

Sylviidæ. See DENTIROSTRES.

Sylvite. KCl. Mineral potassium chloride, of infrequent occurrence, though found in some quantity associated with rock salt at STASSFURT (q.v.).

Sylvius, DE LA BOE, 1614–1672. Iatrochemist, Prof. of Medical Science at Leyden. He attempted to explain the phenomena of respiration, digestion, etc.

Sylvius, JACOBUS, 1478–1555. Prof. of Anatomy at Paris 1550. *Opera Medica*, 1630.

Symbiosis. Peculiar form of commensalism, more particularly referring to the habitation of animal cells by unicellular *Algæ*, as in the Green Hydra, and the yellow cells of Radiolarians. The plant cells absorb the carbonic acid secreted by the animal, and in sunlight produce oxygen, which is absorbed by the animal protoplasm. Thus there is mutual advantage.—In Botany, intimate coexistence of one organism with another, the two being mutually dependent, as the supposed combination of *Fungi* and *Algæ* in the structure of lichens; known also as Consortism.

Symbols. Creeds, confessions of faith, or formal statements of doctrine; so named by Cyprian ab.250; historically treated by Marheineke in *Symbolik*, 1810, by Winer 1824, Möhler (R. C.) 1832, and many recent writers, as Dr. Schaff in *Creeds of Christendom*, 1878.

Symbols. In Chemistry, used to designate the elements and their compounds. Of the elements, the symbols are usually the initial, or first and second, or other letters of their accepted name: *e.g.*, C of Carbon, Ca of Calcium, Ce of Cerium.

Symborodont Dentition. Molar teeth of the amœbodont-lophodont series, having the outer tubercles of their crowns longitudinally elongated and crescentic, while the inner tubercle remains isolated and conic, as in *Symborodon*.

Syme, JAMES, M.D., 1799–1870. Prof. Edinburgh 1833: eminent as teacher, operator, and introducer of new methods. *Principles of Surgery*, 1832; *Pathology and Practice of Surgery*, 1848.

Symington, ANDREW JAMES, b.1825. Scottish writer and compiler. *Chalmers*, 1878.

Symington, WILLIAM, 1764–1831. Scottish inventor of a steamboat, tried 1788. His *Charlotte Dundas* was used for towing on the Forth and Clyde Canal 1801–2, at the time of Fulton's failure on the Seine.

Symmachus, ab.200. Author of a Greek version of O. T., of which fragments remain.

Symmachus. Pope 498–514; opposed till 506 by Laurentius, who had imperial support. He was an active man, magnifying his office and holding several synods.

Symmachus, QUINTUS AURELIUS, ab.340–ab.403. Roman prefect 384, Consul 391; belated defender of Paganism; of pure and lofty type. His *Letters*, in 10 books, survive, with three eulogies and parts of six orations, pub. 1815.

Symmes, JOHN CLEVES, 1742–1814. Delegate to Congress 1785–86; Judge of Northwest Territory 1787; founder of Cincinnati.—His nephew, JOHN CLEVES, U.S.A., 1780–1829, put forth 1818 the theory of "Symmes' Hole," whereby the earth, being hollow, could be entered from the North Pole. This was resuscitated 1876 by his son, Americus Vespucius.

Symmetrical. 1. In Botany, having an equal number of parts in each floral whorl. 2. Having the parts on each side of the principal axis alike in form and size.

Symmetrical Determinant. One whose conjugate elements are equal. This may be either axi-symmetric, in reference to the diagonal of the determinant; or centro-symmetric, in reference to the center of the square array.

Symmetrical Figure. 1. In respect to a center of symmetry, when all lines through that point cut the figure at two symmetrical points. 2. In respect to an axis, where every point on one side of the axis has a corresponding symmetrical point on the other side. 3. In reference to a plane, the same criterion applies. Two figures are symmetrical when every point in one has a symmetrical point in the other.

Symmetrical Points. 1. In reference to a point (center of symmetry) when it bisects the line joining them. 2. In respect to a line (axis of symmetry) when it bisects at right angles the line joining them. 3. In reference to a plane, the same criterion applies.

Symmetry. Harmonious balance of parts along an axis which swings around a single fixed point in every direction. Geometrically, symmetry, as seen in living organisms, may be referred to a central point (centrostigma), a central axis (centraxonia), or a central plane (centrepipeda). See BILATERAL SYMMETRY, LIPOSTAURA, PROMORPHOLOGY, RADIAL SYMMETRY, and STAURAXONIA.—In Mathematics, likeness of position in reference to some fixed element.

Symmetry of Expression. An algebraic expression is symmetrical when its literal elements may be interchanged without affecting its form.

Symonds, JOHN ADDINGTON, 1840–1893. English historian and critic, long resident in Switzerland. *Renaissance in Italy*, 7 vols., 1875–86; *Life of Michelangelo*, 1892.

Symons, GEORGE JAMES, F.R.S., b.1838. English meteorologist, authority on rainfall.

Sympathetic Ink. See COBALT CHLORIDE.

Sympathetic Nervous System. See NERVOUS SYSTEM.

Sympathetic Vibrations. When one sounding body is placed near another, separated only by the air or other

elastic medium, both being of the same pitch, if one body be sounded the other will absorb from the air the note of that particular period which is equal to its own. Such vibrations are called sympathetic. The phenomenon may be practically illustrated by sounding the proper note before an open piano.

Sympathy. Feeling aroused by expression of a similar state of mind in another. The more developed and complete form exists where there is an imaginative reproduction of another's feelings; *i.e.*, fellow-feeling. The emotion depends upon social experience, and its development corresponds to the development of civilization. It is feeble in the lower animals and among the lower races. In Ethics and common use, it refers especially to the sorrows of others.

Sympetalous. See GAMOPETALOUS.

Symphonic Poem. Form of musical composition for orchestra, introduced by Liszt as a substitute for the symphony. It is in a single movement, though divided by changes in tempo, key and sentiment, is based upon a poetical idea, a sequence of incidents or moods to which a clew is given by the title, or a motto which serves as a programme, and frequently has a principal subject which the composer transforms so as to make it express variety of emotional or dramatic content.

Symphony. Musical composition for orchestra, whose characteristics are identical with those of the sonata. The form was established by Hadyn, and brought to its highest estate by Beethoven. Besides these, the greatest symphonists were Mozart, Schubert, Schumann, and Brahms.

Symphysis. In Botany, cohesion or adhesion of parts typically distinct.

Sympiesometer. Form of barometer invented by Adie of Edinburgh, which indicates the pressure of the atmosphere and its variations. It consists of a column of oil, supported in a tube closed at the top by atmospheric pressure, rising against a body of hydrogen gas, which acts like a spring against the oil.

Symplegades. Two small islands at the entrance of the Euxine, fabled to collide when ships passed through. Homer calls them "Wanderers."

Sympodial Dichotomy. In Botany, condition arising from the greater development of one branch of a bifurcation than of the other.

Sympodium. Stem whose main axis ceases to grow, while the branches, continuing to develop, build up the plant body.

Symptoms. Changes of condition, or the phenomena, which occur in the manifestation of diseases, and which serve to point out their nature. Symptoms may be subjective when, as pain, observed by the patient alone; objective, as the physical signs, when observed by the physician; pathognomonic, when they certainly indicate definite diseases. Symptoms complex is the group of individual symptoms together forming the distinctive picture of the disease.

Synacmy. See PROTERANDROUS.

Synagogue. Meeting-house of the Jews, who had one

Synagogue, Great Portland Street, London.

temple for sacrifice, but many synagogues for public worship and instruction. It originated after the return from Babylon, 538 B.C. According to express rabbinic law, it was always to be built on the highest point of the city and ten men were sufficent to form a congregation. In Palestine the entrance faces the south. The ark was the most important object in the building.

Synagogue, GREAT. In Jewish tradition, council of 120 men, assisting Ezra, and surviving him, which regulated the Hebrew Canon and the observance of the law.

Synangium. *Bulbus arteriosus* of *Amphibia.*—In Botany, boat-shaped sorus of certain ferns.

Synanthesis. Maturing of both pistils and stamens of a flower simultaneously.

Synapta. See APODA.

Synapticulæ. Bars that unite the septa of corals.

Synaptosauria. See HYDROSAURIA.

Syncarp. Aggregate or multiple fruits which become compact or fleshy at maturity.

Syncarpous. Gynœcium of a flower when consisting of coalescent carpels.

Synclastic. Curved surfaces are divided by Sir Wm. Thomson into two classes, synclastic and antisynclastic. A tangent plane at any point of a synclastic surface does not cut the surface: hence the curvatures of all normal sections are similarly directed; *e.g.*, a sphere, an ellipsoid. A plane tangent to an antisynclastic surface cuts it, and it bends away from the plane, part from one side, part from the other.

Synclinal Axis. Line toward which the strata dip from opposite sides.

Syncline. Trough or furrow between two anticlines formed by the bending of the strata, as in the Appalachian region.

Synclinorium. Mountain system originating in a submarine synclinal of great extent.

Syncopation. Binding of two similar notes so that the accent intended for the second appears to fall on the first. Its effect in the accompaniment of songs may be charming. See ACCENT IN MUSIC.

Syncope. Abridgment of a word by elision of a vowel or syllable.

Syncretism. Effort to reconcile contending sects or parties on a basis of common belief; especially that of G. Calixtus, 1586–1656, and his son, who sought to mediate between the Lutheran and Reformed systems. The controversy raged with much fury, and Calovius, 1612–1686, won the battle for severe confessional orthodoxy.—In Philosophy, compilation of systems without reference to unity or consistency; thus opposed to eclecticism.

Syncytium. Tissue formed of cells whose bounding walls are indistinct or absent.—In Botany, one in which cell-walls are not developed, as in the vegetative stage of slime-moulds. A plasmodium.

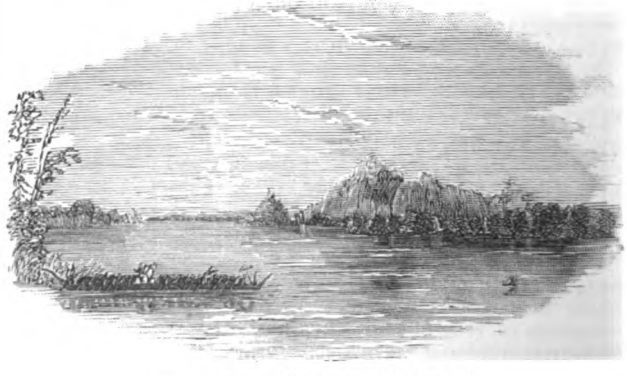
Syndactyli. See LEVIROSTRES.

Syndendrium. United bases of the stomatodendra in *Rhizostomidæ.*

Syndic. Officer of a town or corporation, chiefly in France, Italy, and Geneva.

Syndicate. Organization or association for commercial ends, usually in the way of large financial operations or of publication through various channels.

Syne. River in Burmah, ab. 20 m. n. of Moulmein. Curiously picturesque and almost inaccessible rocks rise abruptly



Syne River, with Burmese Race-boat

from the plain on the banks of the river; nevertheless the Burmese priests have erected a pagoda on the summit of the

highest rock, which is said to have been built by religious penances.

Synecdoche. Figure of speech which puts a part for the whole, a species for its genus, or the reverse, as "a sail" for "ship," or "Boston" for some of its inhabitants.

Synentognathi. See ANACANTHINI.

Synergism. Modification of Luther's doctrine by Melanchthon, making man a coworker with God in redemption. It was opposed by Flacius, and caused much commotion at Jena and elsewhere.

Synesius, ab.375–414. African Neoplatonist, friend and correspondent of Hypatia; Bp. of Ptolemais in Cyrene 410; remarkable for liberal opinions, wide culture, and lofty independence; author of hymns, orations, and letters, collected 1553 and often reprinted; celebrated by Kingsley in *Hypatia.*

Syngenesia. Linnæan class of plants, distinguished by having the anthers united into a tube or ring, as in the composite flowers (natural family *Compositæ*).

Syngenesious. Stamens whose anthers are united into a ring or tube about the style, as in *Compositæ.*

Syngenesis. Theory that each egg contains in miniature the organism which is to develop from it, and this in turn the germs and homunculi that are to come from it. Thus Eve must have had in her all the members of the human race (for all time) telescoped one within the other, in successive generations.

Syngeneticæ. Order of unicellular, colonial, fresh water *Algæ* of the subclass *Phæophyceæ.*

Syngeothermal. Lines joining places at which the temperature of the earth near the surface is the same at a given hour of Greenwich time; epithet applied by Hennessey 1867.

Syngnathous. See LOPHOBRANCHII.

Synod. Any larger church-council; especially, a Presbyterian assembly, including several presbyteries.

Synod, HOLY. Governing body of Russo-Greek Ch., replacing the old Patriarchate of Moscow. It has 12 members, appointed by the Czar.

Synodic Period. Interval between two conjunctions of a planet with the sun, as seen from the earth.

Synod of Dort. See DORT, SYNOD OF.

Synonym. In Botany, more recent or otherwise untenable generic or specific name which has given place to the original or earliest tenable one.

Synonyms. Words of nearly equivalent signification, but usually with some slight difference of shade; therefore important in literary use. The chief collections of them in English are those of Crabbe and Roget.

Synoptic Charts, or WEATHER CHARTS. Maps on which are displayed the meteorological conditions simultaneously prevailing over large regions. In Europe, they usually obtain for a certain hour of local time; in America, they are strictly simultaneous on standard time.

Synpelmous. Arrangement of the flexor tendons in a bird's foot, in which the tendon of the hallux unites with the common tendon of the other toes.

Synpetalous. See GAMOPETALOUS.

Synsepalous. See GAMOSEPALOUS.

Syntax. Division of grammar (so called) treating of the arrangement of words and construction of sentences.

Synthermal. Lines connecting places throughout the world having the same average temperature at the same hour of Greenwich time; epithet introduced by HENNESSY, H. (q.v.), 1867.

Synthesis. Process and method; as process, the psychological combination of different elements of consciousness to form a complex whole; as method in philosophy, the complement of ANALYSIS (q.v.), representing the formation of a unified system of beliefs by articulating them in a systematic whole.

Synthesis, CHEMICAL. Process by which a compound is made from its constituent elements.

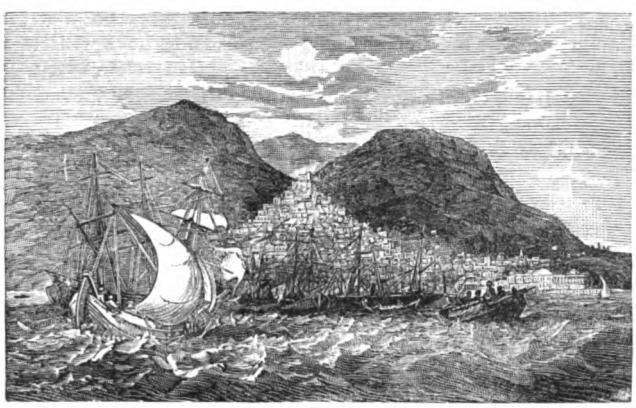
Synthetic Type. Organism which connects, as a link, other organisms, because the separate characteristics of the latter are present in the one animal. Certain fossils have both bird and reptilian characters. As these appeared geologically at the beginning of the period when Reptiles and Birds (*Sauropsida*) first appeared, we may suppose that such forms retain most nearly the characters of the common ancestors of Birds and Reptiles.

Syphax. See MASINISSA.

Sypher, JOSIAH RHINEHART, b.1832. Journalist and lawyer in Pa. *Hist. Pa.*, 1868.

Syphilis. Specific disease of slow evolution, propagated by inoculation (acquired), or by hereditary transmission (congenital). In the acquired form the site of inoculation becomes the seat of the special tissue change (primary lesion); after an interval of 2 or 3 months, constitutional symptoms develop with affection of the skin and mucous membranes (secondary lesion); and, finally, after a period of 3 or 4 years growths develop in the viscera, muscles, bones or skin (tertiary lesion). It is a disease of social impurity, and because of its contagiousness can be conveyed to the innocent. It probably causes more suffering and discomfort than any other single disease. This is an ancient disease, with the Chinese dating back to 2637 B.C., and is claimed to have existed among the ancient Greeks. In 1494 it appeared in the army of Charles VIII. of France, then besieging Naples, and later was prevalent in Europe.

Syra. One of the Cyclades: area 43 sq. m. Its central position in the Ægean makes it an important calling-place



Syra.

of vessels in the Levant. It is the seat of a Greek Abp. and of a R. C. bishop. Its capital, Syra, or Hermoupolis, has some commercial importance. Pop., 1890, 22,104.

Syracuse. Chief city of ancient Sicily; on s.e. coast; founded ab.734 B.C. from Corinth; ruled by Gelo 484, Hiero 478–467, Dionysius 405–367, and other tyrants; attacked by an Athenian expedition 415, which was destroyed 413, ending the Peloponnesian war and the supremacy of Athens; besieged 396 by Carthaginians, who were routed by a pestilence; freed by the hero Timoleon, liberator of Sicily, 343; ruled by Agathocles 317–289, and Hiero II. 270–216, the latter being in alliance with Rome; besieged by Romans 214 (see ARCHIMEDES); taken and sacked 212 B.C.; pillaged and burned by Saracens 878; rebuilt in later times on Ortygia, a peninsula (once an island), its first site. Its coinage of ab.300 B.C. is the most beautiful known; its remains of antiquity are important. Pop. ab.25,000.

Syracuse. Capital of Onondaga co., N. Y.; on Onondaga Lake, in a salt-producing region; settled 1797; chartered 1826 and 1847. Its industries relate chiefly to salt and soda-ash manufacture. Pop., 1890, 88,143.

Syracuse University. At Syracuse, N. Y.; known as Genesee Coll. and located at Lima, N. Y., until 1871; founded 1848; coeducational; under Methodist control; organized in four colleges of liberal and fine arts, medicine, and law. It has 1,135 students, of whom 474 are in the liberal, and 516 in fine arts, with 89 instructors and a library of 47,000 vols., including Von Ranke's collection.

Syr-Darya. River of Turkestan, rising near the Chinese border and flowing w. and n.w. to the Aral Sea. Length ab. 1,300 m., drainage area 120,000 sq. m. As the ancient Jaxartes, described by Herodotus and Strabo, its outlet was into the Caspian.

Syria. Region of w. Asia, e. of Palestine; anciently occupied by Semites; long an independent kingdom, then (ab.740 B.C.) a province of Assyria, as later of Babylonia and Persia; conquered by Alexander 333 B.C.; ruled by the Seleucidæ 301–64 B.C., and then a Roman province till 636; thenceforth held by Mohammedans, and in part by Crusaders 1099–1291; subject to Egypt till 1516 and 1832–41; now part of the Turkish empire.

Antioch was its capital from ab.290 B.C., and Damascus 654–752, as in Hebrew times.

Syriac. See SEMITIC LANGUAGES and ARAMAIC.

Syriac Literature. This is mostly theological writings of the Syriac Church, dating from early Christianity, flourishing from 4th to 10th centuries and declining in the 13th century. Poetry and history were much written, the latter and philosophy being often written in verse. There were many translations from the Greek. The most learned writer was ABULFARAGIUS (q.v.).

Syrian Rite. Of R. C. Ch.; comprising United Syrians, Chaldeans, Maronites, and United St. Thomas Christians. They use a Syrian ritual, not the Latin.

Syringa. Showy, white-flowered shrubs of the genus *Philadelphus*, natural family *Saxifragaceæ*, natives of N. America. See LILAC.

Syrinx. Vocal organ of birds, situated at the point where the trachea divides into the two bronchi. The walls are modified into tympanic membranes, and membranous septa, like vocal cords, are stretched interiorly across the openings of the tubes, so they can vibrate in the passing air current.

Syrinx. Pan's pipe or shepherd's pipe of the ancients; as such a precursor of the modern organ. It consisted of a series of cane tubes of various lengths, fastened side by side and sounded by blowing across their open ends, as boys whistle on keys.

Syrphus Flies. Small two-winged flies whose larvæ, colored greenish to gray, are of service in that they feed on plant lice.

Syrphus Flies.

Syrtis. See SYRTIS MAJOR.

Syrtis Major, or GULF OF SIDRA. On n. coast of Africa, between Tripoli and Barca. Syrtis Minor, or Gulf of Cabes, projects into the coast of Tunis. Both are dangerous from quicksands.

Syrup. Boiled saturated water solution of sugar, with addition of fruit juices or other flavoring substances, as vanilla-bean, ginger or sarsaparilla, and drank with addition of water or soda water. For the latter saponin or egg white is added to produce foaming. Medicinal syrups contain remedial agents dissolved in simple syrup. The term is also applied to MOLASSES (q.v.).

Syrus, EPHREM. See EPHREM.

Syrus, PUBLILIUS, 1st cent. B.C. Roman comic playwright. Some of his *Mimi Sententiæ* survive.

System. In Botany, group of the parts of an organism of the same morphological significance or physiological function.

System, IN GEOLOGY. See INTERNATIONAL CONGRESS.

System, ARTIFICIAL or LINNÆAN. Classification of plants according to an arbitrary rule; as Natural System, that of Jussieu, is according to their relationship.

Systematic Botany. Branch treating of the classification of plants.

Systems of Artillery. The character and arrangement of the material of artillery adopted by a nation at a particular epoch. About the middle of the 16th century France first grouped her artillery into a system having six different calibers, varying from 33¼ pound shot to ¾ of a pound shot, each requiring a different carriage without interchangeable parts; also requiring three different sizes of powder grains. A second system, equally varied in its components, was adopted in the reign of Louis XIV. Valière's system, adopted in 1732, brought about some uniformity in guns, but not in carriages. Gribeauval in 1765 separated the field and siege artillery, making the former simpler and more mobile by improving the carriages; he introduced cartridges, elevating scales, and tangent screws for more rapid and correct firing. This last system was used in the wars of the French Republic and the Empire. In 1827 the stock-trail system was engrafted upon the Gribeauval and other improvements introduced. It was brought to this country by Captain Daniel Tyler, an officer of the U. S. artillery, and was made the basis of the American system, used in the Mexican war and in the Rebellion. In 1850 the 12-pounder bronze gun, firing shot and shell, was introduced by Louis Napoleon, and soon found its way into the services of all nations. Since 1870 the smooth-bores have been replaced by breech-loading rifled guns, so that at present the light artillery or field service systems possess the greatest mobility, simplicity and power they have ever attained. Equally valuable improvements have been made in the siege and seacoast systems, in which uniformity, simplicity, and efficiency have been the qualities sought.

Systems of Fortification. The form of the general outline of the main work in permanent fortification military engineers have classified under four heads, or systems of fortification; viz., (1) the Circular or Curvilinear; (2) the Polygonal or Caponière; (3) the Tenailled; and (4) the Bastioned. The method of fortification is applied to the manner adopted by a nation in fortifying its strategical points, as the German Method (Antwerp); or to those devised by distinguished military engineers, as, Vauban, Cormontaigne, etc. The former belong to the Polygonal system and the latter to the Bastioned.

Systyle. Intercolumniation in which the distance between the columns is equal to their diameter.

Syzygy. Duplex organism formed by external union of the bodies of two individuals that were previously separate, as in many Gregarines and in the worm *Diplozoön*. Except in the latter, this union is not apparently for sexual purposes; it resembles rather the plasmodium, and may secure the advantage that underlies the phenomena of colony-formation among animals, which is usually secured by retaining the primitive connection existing in asexual multiplication.

Syzygy OF THE MOON. Its conjunction or opposition with the sun.

Szabad, EMERIC, b. ab.1822. Hungarian soldier, in U. S. 1861–65. *Hungary*, 1854; *Policy of Europe*, 1857; *Modern War*, 1863.

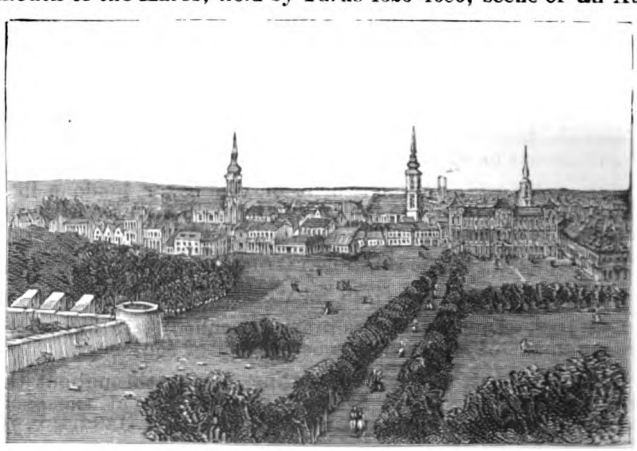
Szabadka. Town of Hungary, 105 m. s.s.e. of Pesth; in a farming region, with a good trade. Pop., 1890, 73,526.

Szalay, LASZLO, 1813–1864. Hungarian biographer, historian, and political writer, in exile 1849–61.

Szarvas, GABRIEL, 1831–1895. Hungarian philologist; ed. *Nyelvör* from 1872.

Szechenyi, ISTVAN, COUNT, 1792–1860. Hungarian reformer and Minister of State.

Szegedin. Town of Hungary, on the Theiss, opposite the mouth of the Maros; held by Turks 1526–1686; scene of an Austrian victory Aug. 3, 1849; partly destroyed by flood 1879. It has a good trade and extensive manufactures. Pop., 1890, 87,410.



Szegedin, before the Inundation.

Szema Kwang, 1009–1086. Chinese historian and lexicographer.

Szema Tsien, ab.163–ab.85 B.C. Chinese historiographer and chronologer.

T

Taafe, EDUARD, COUNT, 1833–1895. Austrian Prime Minister 1869 and 1879–93.

Tabard. 1. Sleeveless cloak worn by mediæval knights over armor. 2. Official garment of heralds.

Tabari, 838–922. Moslem of Bagdad; commentator on the Koran. His *Annals* run from the creation to his time.

Tabasheer. Siliceous substance, of low specific gravity, secreted in the joints of the bamboo, *Bambusa vulgaris*.

Tabb, JOHN B., b.1845. Prof. St. Charles Coll., Ellicott City, Md., since 1884. *Poems*, 1894; *Lyrics*, 1896.

Tabernacle. Portable sanctuary of the Israelites, in the wilderness and in Palestine, on the model of which the Temple was built ab.1000 B.C. (see HOLY PLACE and MOST HOLY PLACE). It was made of acacia-wood, overlaid with gold, and protected by ample coverings of cloth and of seal or badger skins. The term is also applied to niches for images and sepulchral monuments, surmounted with rich canopy work.

Tabernacles, FEAST OF. One of the 3 great Jewish feasts, lasting a week in Sept. or Oct., during which the people dwelt in booths, and gave themselves up to rejoicing over the ingathering of the fruits. See PASSOVER and PENTECOST.

Tabes Dorsalis. See LOCOMOTOR ATAXIA.

Tableaux Vivants. "Living pictures"; introduced in France ab.1785; since familiar in England and America.

Table-Lands. Elevated plains, as in central Asia, w. U. S., and Spain. See PLATEAU.

Tables. Backgammon, played by two persons with men or pieces, according to the throws with two dice, upon a board divided vertically into two parts, and having 24 points. A variety of games were played upon this board or "tables," the origin of which may be traced to classical antiquity.

Tablet. In Pharmacy, a cylindrical or disk-shaped body formed from powdered drugs. The tablet may be composed of the drug without admixture, or it may be triturated with some inert substance, as sugar of milk; it may be caused to adhere by compression or by making a paste of the powder by mixing with a volatile liquid. This paste is filled into molds and removed. The liquid forming the paste volatilizes, leaving the triturate.

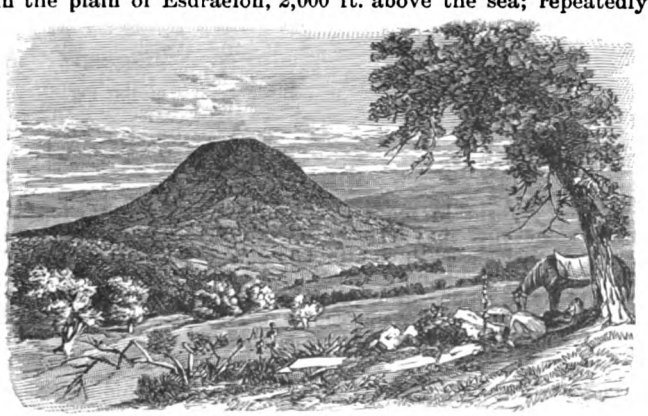
Table Turning. Phenomenon much talked of in U. S. and England ab.1850; credited to spirits, but probably caused by unconscious muscular action of hands clasped around or resting on the table.

Tabley, JOHN BYRNE LEICESTER WARREN DE, BARON, 1839–1895. English poet.

Taboo. Edict by a chief among Pacific Island tribes, declaring certain acts unlawful; *e.g.*, during a stated period certain trees, animals, crops, etc., are sacred and must not be touched or destroyed. It resembles the close season for game, etc., among civilized peoples. The penalty for violation of a taboo is death. This is supposed to explain the killing of Capt. Cook at the Hawaiian Islands.

Tabor. Instrument between drum and tambourine; associated with the fife.

Tabor, MT. Mountain of Galilee, 6 m. s.e. of Nazareth, in the plain of Esdraelon, 2,000 ft. above the sea; repeatedly



Mount Tabor.

named in O. T., but not in the New; traditional site of the transfiguration, and a Crusading church on the summit commemorates this event. Scene of Bonaparte's victory over the Turks, April 16, 1799. Altitude ab. 1,000 ft.

Tabor, HORACE AUSTIN WARNER, b.1830. Capitalist; Lieut.-gov. of Colorado 1878–84; U. S. Senator Feb.-March 1884.

Tabor College. Founded by Congregationalists as an academy at Tabor, Ia., 1854; chartered 1866. It has 13 instructors and ab. 230 students.

Taborites. Bohemian adherents of Huss, who took up arms ab.1420, led by ZISKA (q.v.); so called from their stronghold Mt. Tabor; opposed to the Calixtines or moderate reformers, with whom, after the defeat of their common foes, they waged a mutually destructive war.

Tabriz. Ancient city of n.w. Persia, ab.300 an Armenian capital; injured by several earthquakes and Turkish attacks; of some commercial importance. Pop. ab. 175,000.

Tabulæ. Horizontal partitions in the thecæ of some corals.

Tabular Spar. See WOLLASTONITE.

Tabular Standard. See MULTIPLE STANDARD.

Tabulata. See MADREPORARIA.

Tabulate Corals. Those having horizontal plates in the thecæ, and weak septa; not a natural group. See HELIOPORIDÆ.

Tac, SIXTUS LE, 1649–1699. French missionary in Canada from 1676. *Hist. Nouvelle France*, pub. 1888.

Tacahout. Nutgall growing on the tamarisk in India and Barbary; source of gallic acid.

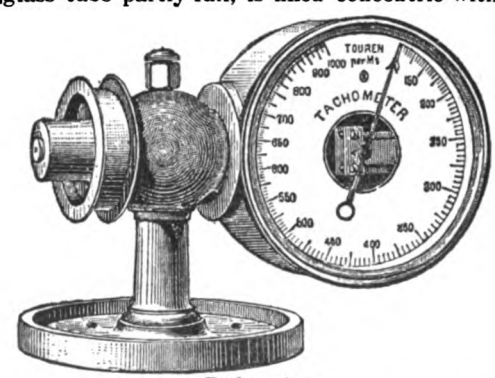
Tacamahac. See POPLAR.

Taccaceæ. Natural family of flowering plants, of the class *Angiospermæ* and subclass *Monocotyledons*, comprising 2 genera and ab. 10 species, natives of the tropical lands of both hemispheres.

Taché, SIR ÉTIENNE PASCAL, 1795–1865. Canadian official and author, knighted 1858.—His nephew, JOSEPH CHARLES, b. 1820, pub. *Esquisse sur le Canada*, 1855, and other books.—His brother, ALEXANDER ANTOINE, 1823–1894, became Bp. of St. Boniface (Winnipeg) 1853, and Abp. 1871.

Tachhydrite. $CaMg_2Cl_6+12aq$. Extremely soluble hydrous magnesium calcium chloride, found associated with rock salt at Stassfurt.

Tachometer. Speed indicator. Special forms are adapted for measuring variations in the velocity of revolution of machines. A small cistern of mercury, from the center of which rises a glass tube partly full, is fixed concentric with the re-



Tachometer.

volving part. As the centrifugal tendency depresses the middle part of the mercury in the cistern, the column in the tube will fall and the tube may be empirically graduated to indicate any speed within certain limits.

Tachycardia. Excessively rapid heart action, due to various causes: nervous excitement, violent exertion, a weakening of the inhibitory nerves of the heart from pressure by tumor, or other cause. A very rare form is known as paroxysmal tachycardia, and is characterized by spells of rapid beating, sometimes at the rate of 200 or more beats in a minute. The attacks may follow each other at regular intervals, lasting in some instances but an hour or so.

Tachygraphy. See SHORTHAND.

Tachylite. Rapidly cooled BASALT (q.v.), differing from

obsidian in having less silica in its composition. Obsidian has from 60 to 80 per cent silica; tachylite from 50 to 55.

Tacitus, MARCUS CLAUDIUS, 200–276. Roman senator of high character and patriotic aims, supposed descendant of the historian; emperor from Sept. 275.

Tacitus, PUBLIUS CORNELIUS, ab.54–ab.118. Prætor 88, consul suffectus 98, proconsul of Asia ab. 114; author of *Dialogus de Oratoribus, Agricola, Germania, Histories,* and *Annals.* The two latter, which survive only in part, are remarkable for condensed and vigorous style, deep thought, and vehement hatred of tyranny and corruption. After Thucydides he is the first, as he is one of the greatest, of philosophic historians.

Tack, NAUTICAL. Course of a ship with reference to the position of the sails. Starboard tack when the vessel is close-hauled with the wind on the starboard side, larboard when on the other.

Tacking. Rule enforced by English (but not by American) courts of equity, that a third or subsequent incumbrancer may buy the first incumbrance and tack his to it, so as to compel intervening incumbrancers to pay both, if they would redeem from the first.

Tacoma. Capital of Pierce co., Wash.; on a bay e. of Puget Sound, 41 m. s. of Seattle; founded 1868, chartered 1883; of recent growth. It has a fine harbor, a large commerce, especially with Japan, considerable manufactures, and three colleges. Pop., 1890, 36,006, since much increased.—Mt. Tacoma or Rainier near by has a height of 14,440 ft.

Tacon, MIGUEL, 1777–1855. Spanish officer, b. in Colombia; Gov.-gen. of Cuba 1834–38.

Taconic. Rocks of the Taconic range, chiefly in e. N. Y., and now known to belong to different ages. The term, proposed by Emmons, is passing out of use.

Tactics. Science of organizing troops in proper formation for the march and for battle, and the art of handling them on the battlefield; called grand tactics when applied to large bodies comprising different arms of the service, and minor tactics when restricted to a single arm or to small bodies. Drill tactics pertains to the different formations of line or column and the methods of passing rapidly from one to the other, and at the same time keeping the troops under the complete control of their commander. The essential principles of all tactical movements are unity of command, concentration, and mobility consistent with the least loss and exposure when under fire. Historically the infantry formations exhibit an improvement in one or more of these essentials. The Greek phalanx of 1,024 files front and 16 ranks deep, comprising 16,384 men, was unwieldy and capable of moving only on selected ground. Greater mobility was obtained by the Roman legion, which was composed of three lines, each of ten maniples, each maniple having ten ranks deep and twelve files front in the first two lines and six files in the third line, the maniples being arranged in quincunx order to facilitate concentration and to give mobility. The Roman cohort followed, it being formed of ten ranks, each of 50 to 100 men front: the legion was made up of two or three cohorts, with light troops as skirmishers on the flanks. The formations of the early Germans and Franks more nearly resembled that of the phalanx, their troops being massed in large bodies until about the time of Charles Martel. Under Charlemagne cavalry began to assume more prominence, and infantry, then considered of less importance, suffered in its organization until about the commencement of the 12th century. It was then armed with the lance or pike and retained its depth until the middle of the 16th century, when, owing to a more general use of firearms, its depth gradually decreased from ten ranks to six or even three in the time of Gustavus Adolphus. With the adoption of the bayonet the number of ranks was reduced to four. Marshal Saxe introduced the cadenced and lock step: Frederick the Great adopted the three-rank formation, fully developed the marching and maneuvering power of his infantry, and greatly increased the accuracy and rapidity of musketry fire. In 1810 the English, and also the French and Swiss shortly afterward, adopted the two-rank formation. Other changes, increasing the flexibility of formations and mobility in handling troops, were brought about by introducing the various subdivisions of the army, such as corps, divisions, brigades, regiments, battalions and companies: these permitted the maneuvering of an army in fields which were formerly impossible when the army moved as a whole or by its wings. Battalion tactical units permitted the combinations of deployed lines and columns, giving a rapid extension for fire and mass formation for attack, as frequently exhibited in the Napoleonic wars. The introduction since 1861 of the modern rifled small arm and field gun have brought about fundamental changes in tactical formation for battle, eliminating all deep formations and bringing into prominence the open or skirmish order for the front of attack: the main element of weakness being a loss of unity and of concentration, and requiring in the individual soldier much finer qualities than ever before.

Taddeo. See GADDI.

Tadmor. City founded by Solomon as a trading-post in the Syrian desert: later, as PALMYRA (q.v.), a city of great wealth and magnificence, seat of Zenobia; now in ruins.

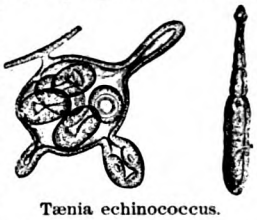
Tadousac. Oldest town in Canada, famous as a summer resort, near the confluence of the St. Lawrence and Saguenay Rivers. Pop. of the district 2,400.

Tael. Chinese monetary unit, equivalent to ab. 1,250 copper cash, or 1⅓ oz. silver.

Tænia. See TAPEWORM.

Tæniadæ. Family of *Cestoda,* which includes the Tapeworms. Each worm consists of a small head armed with suckers and hooks, for holding to the wall of the intestine of its host; from this grows out a chain of segments (proglottides), that increase in size toward the posterior end, where the oldest are. Each segment has its own reproductive organs; the eggs begin development before the proglottis is set free. The eggs finally may be eaten, with the food of some animal, and the gastric and other juices dissolve the shell and set the larva free. This then burrows into the tissues, becoming encysted, and changed to a sac, in which several tapeworm heads are budded out. This is the cysticercus stage. The flesh of this host being eaten, the scolices are set free as tapeworm heads that fasten on the alimentary canal of the new host. The cysticercus stage in man and domestic animals is also called the Echinococcus. See TÆNIA SOLIUM and TAPEWORM.

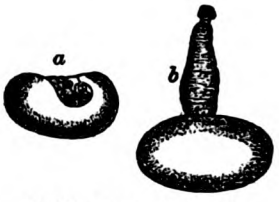
Tænia Echinococcus. Tapeworm infesting the dog. It has hooks and suckers, but only four segments, the last of which contains mature eggs. The ripe proglottis becomes freed, and new ones take its place successively. The eggs develop in water, and become proscolices in the intestine of any animal (including man) which drinks water containing them. The proscolex then bores into some internal organ and becomes a scolex, about $\frac{1}{100}$ of an inch in diameter. This has the power to produce other scolices indefinitely, all gifted with a similar power, until the organ becomes infested with a hydatid tumor, that may reach the size of an orange. If the flesh infested with hydatids be eaten by a dog, the scolices become tapeworms. Another tapeworm that infects the dog has its scolex stage in the common louse of the dog. Another species produces hydatids in the brain of sheep, which consequently suffer from staggers.



Tænia echinococcus.

Tænia Solium. Commonest of Tapeworms infesting man. On its head is a double circle of 26 hooks. The proglottides (joints) are ⅛ in. long, ¼ in. broad, and there are ab. 850 of them in a mature worm. The last hundred or so have ripe eggs, which are thrown off with the excrement: if swallowed by a pig, they hatch and become encysted in its flesh, causing the pork to be measly. Each cyst is ab. ¼ in. long. Similar

Head of *Tænia solium.*



Bladder-worm of the Pig (*T. solium*):

a, with invaginated head, about natural size; *b*, with evaginated head, a little larger than natural size.

cysts may form in man or other animals swallowing the eggs: sometimes they form in the brain. If some vital nerve cell is disturbed, death results, but otherwise, unless the cysts are very numerous, no serious disturbance may be felt. The measly flesh, when eaten uncooked, gives rise to the mature worm by simple growth from the back part of the head, which constitutes the main part of the cyst.

Tæniatæ. See CESTIDÆ.

Tæniodonta. Suborder of *Bunotheria,* including Eocene Mammals, with Edentata-like molars and Rodent-like inferior incisors, but with the upper incisors faced on both sides with enamel, and growing from persistent pulps.

Tænioglossa. Group of ctenobranchiate Gastropods, in-

cluding forms having two small jaws and a long radula with seven plates in each transverse row of teeth. Some are holostomatous, others are siphonostomatous. Examples of the former are the Winkles (*Littorinidæ*), freshwater Snails (*Paludinidæ*) and Vermetus. To the latter belong *Cypræa*, *Strombus*, *Natica*, etc. By a different division of the group we have the *Chiastoneura* (*Littorina*, *Paludina*, *Vermetus*, etc.), and *Orthoneura* (*Natica*, *Cypræa*, *Strombus*).

Tæniolæ, or TÆNIOLATA. See SCYPHOMEDUSÆ.

Taffeta. Plain silk, of varied quality and color, and sometimes mixed with wool.

Taffrail, or TAFFEREL. Upper part of a ship's stern.

Taft, ALPHONSO, LL.D., 1810–1891. Judge Cincinnati Superior Court 1866–72; U. S. Sec. of War 1876, and Atty.-gen. 1876–77; Minister to Austria 1882, and to Russia 1884–85.

Tag. Child's game, in which one player, known as It, pursues the others and endeavors to catch them. The one caught in turn becomes It and continues the game. There are many varieties, as Cross-tag and Squat-tag. In Japan, Tag is called *Oni gokko* or "Devil Touching," and It is *Oni* or Devil. In Corea, it is called Watchman-catching, the pursuer being the Watchman. In Canton the game is played between "soldiers" and "thieves."

Tagala. Most important of the Malay tribes of the Philippine Islands. They are of medium size, with straight black hair, low forehead, large eyes and mouth, flat nose, small hands and feet. The women wear pure white clothing. They are gentle, but love gambling, opium-smoking, and music. They can read and write, and are skilled carvers and weavers. They are closely related to the Formosans, but more civilized.

Taganrog. Seaport of Russia, on the shore of the Gulf of T., an inlet n.e. from the Sea of Azov; founded by Peter I. ab.1720. It has a large export trade. Pop. ab.50,000.

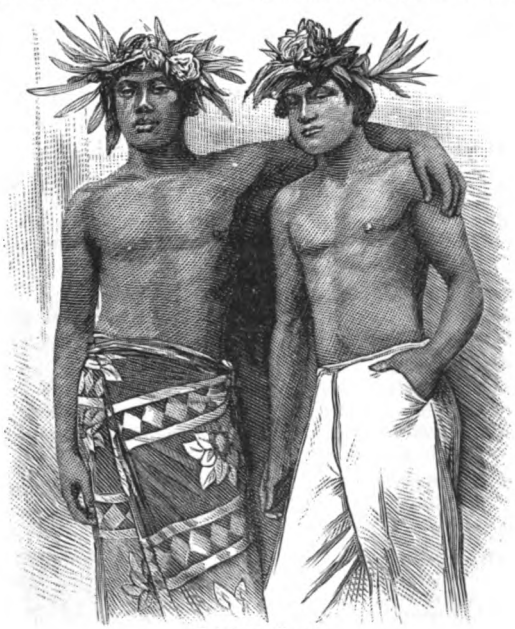
Tagliamento. River in Lombardy, near which Bonaparte defeated the Austrians under Duke Charles, March 16, 1797.

Taglioni, MARIA, 1804–1884. Italian dancer, famous through Europe 1822–47; Comtesse de Voisins 1832.—Her father, FILIPPO, 1777–1871, and brother, PAUL, 1808–1884, were noted ballet-masters.

Tagus. River of Spain, heading in the Castilian Mts., e. of Madrid, and flowing mainly s.w. across Portugal to the Atlantic, near Lisbon. Length 566 m., drainage area 34,000 sq. m.

Tahiti. Chief of the Society Islands: in the Pacific, ab. 2,100 m. n.e. of New Zealand; held by France. Area 400 sq. m., pop. ab.10,000.

Tahitians. Polynesian Malays, celebrated for physical beauty. Morally they stand low. The women are much smaller than the men. The principal weapon is the sling.



Tahitian Types.

They are good sailors, courteous but cruel, generous but deceitful, and fond of dissipation. Their cooking is done by baking and steaming on hot stones.

Tahlequah. Cherokee capital, in Indian Territory; founded 1840. Pop. ab.3,000.

Tahoe, LAKE. In the e. foothills of the Sierra Nevada, on the boundary between Cal. and Nevada. Elevation 6,225 ft., area 195 sq. m.

Tahpanhes. Town in Lower Egypt, seat of Pharaoh-Hophra, the ruins of whose palace, with the brick pavement (mistranslated *kiln*) on which Jeremiah prophesied (Jer. xliii. 9) have lately been discovered.

Tail. In Botany, long, slender appendage, as to a seed or achene.

Tailed Men. A Devonshire superstition attributes a tail to Cornishmen, which was referred to divine vengeance upon them for having insulted St. Thomas à Becket. Lord Monboddo argued that a tail was a desideratum. Common report attributed tails to the Niam-niams, and many stories are told of the belief in tailed men in Abyssinia. Among the American Indians there are stories of men once having tails, which they forfeited by some misdemeanor.

Tailings. Material of lowest value, separated from the richer portions of ore in a process of concentration. The tailings from any given stage of a concentration process may be further treated on machines devised for the purpose, or may run to waste.

Taillandier, RENÉ GASPARD ERNEST, or SAINT-RENÉ, 1817–1879. Prof. Montpellier 1843, and Paris 1863; Academician 1873; writer on Germany. *Scotus Erigena*, 1843; *Servia*, 1871; *Études*, 1881.

Tailor Bird. Name given to various genera of birds which skillfully construct their nests. They are found in tropical countries. The principal genera are *Suthora*, *Suya*, *Prinia*, *Sutoria*, and *Orthotomus*.

Tainan. See TAIWAN.

Taine, HIPPOLYTE ADOLPHE, D.C.L., 1828–1893. Prof. Paris 1864, Academician 1879; historian and critic. Chief among his numerous works are the familiar *History of English Literature*, 4 vols., 1863–64, tr. 1872–74, and *Origines de la France Contemporaine*, 5 vols., 1875–90. Both are monumental works, the result alike of genius and of conscientious industry.

Taiping (or TAEPING) **Rebellion.** In China 1850–64. The head of it styled himself the Heavenly Prince, proclaimed a spurious Christianity, and aimed to set up a native dynasty in place of the ruling Manchu. COL. C. G. GORDON (q.v.) was largely instrumental in suppressing the insurrection.

Tait, ARCHIBALD CAMPBELL, D.D., LL.D., 1811–1882. Headmaster of Rugby 1842, succeeding Dr. T. Arnold; Dean of Carlisle 1850, Bp. of London 1856, Abp. of Canterbury 1868; a moderate and judicious primate. *Modern Theology*, 1861.

Tait, ARTHUR FITZWILLIAM, b. 1819. Anglo-American painter. N.A. 1858.

Tait, LAWSON, M.D., b.1845. Scottish surgeon. *Diseases of Women.*

Tait, PETER GUTHRIE, b.1831. Prof. Belfast 1854, Edinburgh 1860; writer on physics and higher mathematics. *Thermodynamics*, 1868; *Paradoxical Philosophy*, 1878.

Taiwan, or TAINAN. Capital of FORMOSA (q.v.) till 1885; 3 m. from w. coast, and connected with the sea by canals; treaty port, with considerable commerce. Pop. ab. 135,000.

Tai-yuen. Chinese city, ab. 400 m. s.w. of Peking; capital of the Shansi province. It consists of an inner and outer

Cliff in yellow earth near Tai-yuen.

city, each surrounded by walls, the inner city being 2⅜ m. long and 1⅜ m. wide, and the wall being pierced by 8 gates. It is of no commercial importance, but contains the govern-

ment arsenal, powder mills, and cannon foundry. Pop. ab. 200,000.

Talavera de la Reina. Spanish town, on the Tagus, 75 m. s.w. of Madrid; scene of a French defeat, July 27–28, 1809, by the British and Spanish armies under Wellesley.

Talbot. Breed of dogs, formerly known as St. Hubert, and probably the original stock of the bloodhound.

Talbot, JOHN, 1645–1727. English missionary of the S.P.G., in America 1702–24; rector at Burlington, N. J., 1709–24; doubtfully alleged to have been consecrated by nonjuring bishops 1721.

Talbot, RICHARD. See TYRCONNEL.

Talbot, SILAS, U.S.N., 1751–1813. Mass. officer, distinguished in naval encounters 1776–80; prisoner in England 1780–81; M.C. from N. Y. 1793–95; Captain 1798–1801.

Talbot, THOMAS, 1818–1886. Gov. of Mass. 1873–74 and 1878–80.

Talbot, WILLIAM HENRY FOX, 1800–1877. M.P. 1832–34; discoverer of the calotype or talbotype process in photography 1841; decipherer of cuneiform inscriptions from Nineveh. *Hermes*, 1838–39; *Pencil of Nature*, 1844–46; *Etymologies*, 1846. See PHOTOGRAPHY.

Talbotype. See TALBOT, W.

Talc. $H_2Mg_3Si_4O_{12}$. Very soft, white or greenish white, hydrous magnesium silicate, with a greasy feel, that occurs as an essential mineral component in many schistose rocks, and also in independent masses and forms that find extensive use in the arts. A fibrous variety from n. N. Y. has been used in the manufacture of paper: the foliated forms add to the value of some solid lubricants. A coarser and more rock-like variety is known as soapstone or steatite. The latter has been quarried in large quantity in e. Pa. and Vt. for commercial uses.

Talcott, ANDREW, 1797–1883. U. S. engineer officer 1818–36; later employed on rivers, boundary surveys, and railways. —His brother, GEORGE, 1786–1862, was an officer of artillery and ordnance 1813–51.

Talent. See GENIUS.

Talent. Ancient Greek weight which was applied to silver and gold money, although no single coin could be made of this weight. Thus the Attic talent after Solon was 56 lbs., 15¼ oz., 14.09 grs. avoirdupois, and was divided into 100 minæ. At this time the talent, when used as a commercial weight, was made heavier than the coin talent, equaling over 85 lbs. The talent of Ægina seems to stand to the Attic in the proportion of 5 to 3. The coinage differs a little from this. The Hebrew talent was, in gold, ab.1,320,000 grs. Troy, twice the weight and ab. 24 times the value of the silver talent.

Talfourd, SIR THOMAS NOON, 1795–1854. English dramatist, biographer of Charles Lamb, 1837–48; M.P. 1835–41 and 1847–49; Judge and Knight 1849. *Ion*, 1835; *Essays*, 1842; *Vacation Rambles*, 1844–46.

Taliaferro, JOHN, 1768–1853. M.C. from Va. 1801–3, 1811–13, 1824–31, and 1835–43.—His relative, WILLIAM BOOTH, b.1822, became Brig.-gen. C.S.A. 1862 and Major-gen. 1865.

Taliesin. Welsh bard, probably of 12th century. Some of his reputed compositions are extant.

Talipes. See CLUBFOOT.

Talisman. Engraved charm intended to arrest evil influences; usually cut upon stone or metal, and referring to some planet or star; in a wider sense, all engraved charms, such as those used by the Mohammedans, with Arabic inscriptions. Among the Chinese, a common talisman worn by children bears the seven stars of the Great Bear.

Tallahassee. Capital of Fla. and of Leon co., midway between the Ga. line and Gulf of Mexico. Pop., 1890, 2,934.

Tallahatchie River. In Miss., flowing 250 m. s.s.w., and, uniting with the Yallobusha, forms the Yazoo.

Tallemant des Réaux, GÉDÉON, ab. 1619 - ab. 1692. French author. His *Historiettes*, 376 biographic and anecdotical sketches, were written ab. 1658, and pub. in 6 vols. 1834.

Talleyrand-Perigord, CHARLES ANGÉLIQUE, BARON, 1821–1896. French Ambassador at Berlin 1862, and at St. Petersburg 1864; Senator 1869.

Talleyrand-Perigord, CHARLES MAURICE, DUC DE, PRINCE OF BENEVENTO, 1754–1838. Abbot of St. Denis 1775; Bishop of Autun 1788; Deputy to States General 1789. He joined the Tiers État; proposed the suppression of tithes; was in England 1792–94, and in the U. S. 1794–96; was Minister of Foreign Affairs 1797–1807, and a power in Europe; intrigued

Talleyrand.

against Napoleon from 1811; was Pres. of Council 1814–15; and Ambassador to England 1830–34. He possessed marvelous penetration of intellect and great duplicity. His *Memoirs*, 5 vols., 1889–91, disappointed public expectation.

Tallien, JEAN LAMBERT, 1769–1820. French terrorist, violent at Paris and Bordeaux till converted by Mme. de Fontenay, whom he married Dec. 1794; Pres. of Convention March 1794, and chief agent in destroying Robespierre and his faction July 27; powerful for a time, but soon relegated to obscurity.

Tallis, THOMAS, ab.1516–1585. Organist of the Chapel Royal; composer of anthems, Te Deums, etc.; "father of English cathedral music."

Tallmadge, BENJAMIN, 1754–1835. Major 1777, Colonel 1779; Aid to Washington; especially distinguished for exploits near New York 1779–80; custodian and friend of André; M.C. from Conn. 1801–17. *Memoirs*, 1859.—His son, FREDERICK AUGUSTUS, 1792–1869, was Recorder of New York 1841–46 and 1849–51, M.C. 1847–49, and Supt. of Police 1857–1862. He suppressed the Astor Place riots May 1849.

Tallmadge, JAMES, LL.D., 1778–1853. M.C. from N.Y. 1817–19; member of N.Y. Constitutional Conventions 1821 and 1846; Lieut.-gov. 1825–26; pres. American Institute 1831–50.

Tallmadge, NATHANIEL PITCHER, 1795–1864. U. S. Senator from N. Y. 1833–44; Gov. of Wis. 1844–46.

Tallow. Fat rendered from the fatty tissues of cattle and sheep; known accordingly as beef and mutton tallow. It is used as lubricant and in making soap, candles and oleomargarine.

Tallow-Tree. *Stillingia sebifera*. Tree of the natural family *Euphorbiaceæ*, native of China; cultivated in warm regions for its fruit, which yields a tallow-like substance.

Talma, FRANÇOIS JOSEPH, 1763–1826. Greatest of French tragic actors. His first appearance was in 1787, his first eminent success 1789: in 1791 he founded the Théâtre de la République. He introduced historically correct costumes, and was most eminent in classic parts.

Talmage, THOMAS DEWITT, D.D., b.1832. Pastor Brooklyn Tabernacle 1869–94, where his audiences were immense; author of many volumes of sermons and addresses.

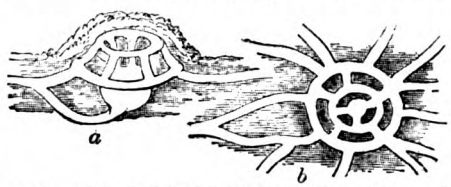
Talmud. Collection of Jewish law not included in the Pentateuch, usually regarded as comprising the Mishna or Midrash and Gemara. Two great collections exist, the Jerusalem and Babylonian, both dating from ab. 2d to 6th century. Numerous editions of both exist, with an enormous body of critical Talmudic literature. The Mishna includes the Mosaic traditions, maintained to have been transmitted orally till the early Christian centuries. The Gemara comprises commentaries and casuistical decisions as to the application of the Mishna.

Talon, JEAN BAPTISTE. 1625–1691. Second French intendant of Canada 1663, which he did much to develop.

Talpidæ (MOLES). Family of *Insectivora*, distinguished by having feet fitted for burrowing, small concealed eyes and ears, soft thick fur, strong clavicles, short arm, and rudimen-

Common Mole (*Talpa europæa*).

tary tail. The mole burrows rapidly underground, constructing its nest and galleries with radiating passageways, all subterranean. Its food is principally animal. In America we



a, section of the habitation of the mole; *b*, plan of ditto.

have also the Star-nosed Moles with longer tail and a fringe of fleshy processes surrounding the tip of the snout, and the Shrew Moles (*Scalops*), with elongated snout, short tail, and webbed feet.

Talvi. Pseudonym of the wife of E. ROBINSON (q.v.). It is simply the initials of her maiden name, T. A. L. von Iakob.

Tamarack. American Larch, *Larix laricina*. Large tree of the natural family *Pinaceæ*, native of n. N. America; also known as Hackmatack.

Tamarind. *Tamarindus indicus*. Tall tree of the natural family *Leguminosæ*, native of Arabia; naturalized in tropical America; planted for its fleshy pods, which are candied and esteemed as a delicacy.

Tamariscineæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 5 genera and ab. 45 species, distributed throughout the temperate and warm regions of the n. hemisphere and in s. Africa.

Tamarisk. *Tamarix gallica* and other species of the natural family *Tamariscineæ*, natives of the Old World; planted for ornament. They are narrow-leaved shrubs with small flowers.

Common Tamarisk (*Tamarix gallica*): *a*, a flower.

Tambora. See SUMBAWA.

Tambour. Frame upon which material is stretched for embroidering; also the embroidered muslin or other material, the tambouring being performed by a small hook instead of a needle.

Tambourine. Musical instrument consisting of a hoop, on one side of which is stretched a vellum head, the other being open, with metallic clappers placed around it. It is beaten by the hand or shaken. It is probably of Oriental origin. It is much used in Spain.

Tamerlane. See TIMUR-LENK.

Tamiathis. See DAMIETTA.

Tamil Language. One of the Dravidian group.

Tammany. Political organization in New York City, founded by Wm. Mooney 1789 (ostensibly as a charitable society), as the Columbian Order; incorporated 1805, named from a Delaware chief. Since 1800 it has largely controlled the politics of New York, and often those of the State. The exposures resulting from the defeat of the Tweed Ring in 1871 brought it into discredit, but it was reorganized, and still retains much of its ancient power to control local elections and State legislation. In 1897 it carried the first election in Greater New York by a plurality, and thus obtained control of the city government for four years.

Tammuz. Idol worshiped in Babylon with obscene rites, especially in July; identified by Jerome with Adonis; mentioned by Ezekiel, viii. 14.

Tampa Bay. On w. coast of Florida; length ab. 35 m. The upper part of the bay forms the harbor of the city of T., and is the largest on the Gulf of Mexico. T. has manufactures of cigars and is one of the places of export of Florida phosphates. Pop. 5,500.

Tampon. Any material, as sponge, muslin bandage, etc., used to plug the cavity of an organ to control bleeding after the fashion of a bandage used externally. In view of the possibility of infection, care must be taken to use material that has been made aseptic. The tampon is used chiefly to control otherwise uncontrollable hæmorrhage in the uterus and the nose.

Tamsui. City of n. Formosa; seaport open to foreign commerce. Pop. ab. 95,000.

Tanagers. Small conirostral song birds, of bright colors, allied to Finches. There are over 350 species, most of which are S. American, mainly tropical: there are only 5 species in N. America, and but 2 go n. as far as Canada; viz., *Piranga erythromelas* (*rubra*), the Scarlet Tanager, and *P. rubra* (*æstiva*), the summer Redbird. They feed on beetles and are shy: the latter is rarer than the former in the U. S. The former has the cutting edge of the upper mandible toothed: the male is brilliant scarlet, with black wings and tail. The female is clear olive green above, greenish yellow below, with grayish wings and tail. The latter has mandible not toothed, male rose red, and wings dusky. The female is brownish olive above and dull yellow below.

Tanagra. Ancient city of e. Bœotia, on the Asopus; scene of a Spartan victory over Athenians 457 B.C. Here were discovered 1873 many figurines, terracotta statuettes, mostly of women, ht. 6 to 9 in. They are probably from tombs.

Terracotta Figure from Tanagra.

Tanais. Ancient name for the river DON (q.v.).

Tananarivo. See ANTANANARIVO.

Tancred. 1. 1078–1112. Sicilian, prominent in the first Crusade; notable for valor, wisdom, and generosity; became Prince of Tiberias 1100, and of Edessa 1112; celebrated by Tasso. 2. King of Sicily 1190, d. 1194.

Tandem Engine. Horizontal compound engine in which the pistons of high and low pressure cylinders are on the same rod, and one in front of the other. It is the STEEPLE ENGINE (q.v.) on its side.

Tandy, JAMES NAPPER, 1740–1803. Irish revolutionist, in exile 1793–98; tried for treason 1800; sentenced to death 1801, but allowed to escape.

Taney, ROGER BROOKE, LL.D., 1777–1864. Laywer of Md.; U. S. Atty.-gen. 1831; Sec. Treas. 1833. Pres. Jackson directed the removal of government deposits from the U. S. Bank to selected local banks, and Taney gave the necessary order, whereon the Senate refused 1835 to confirm him as Associate Justice of the U. S. Supreme Court. He succeeded Marshall, March 1836, as Chief-justice. The most conspicuous incidents of his career in this great position were the DRED SCOTT (q.v.) decision 1857, and his effort to maintain the writ of habeas corpus against Pres. Lincoln's suspension of it 1861. Though a man of great learning and high integrity, he was long regarded in the North as a tool of tyranny and of the slave power.

Tanganyika. Lake of e. central Africa, in lat. 3°–9° S.; 420 m. long (n. to s.), and 10 to 60 wide; elevation 2,756 ft.; drained by the headwaters of the Congo; discovered by Speke and Burton 1858, explored 1871–76.

Tangent, GEOMETRICAL. Limiting position of the secant. That to any locus has one element in common with that locus, and at this element the same direction.

Tangent, TRIGONOMETRICAL. Ratio of the ordinate of any point on the terminal line of an angle (the initial line being the axis of X) to the abscissa of that point.

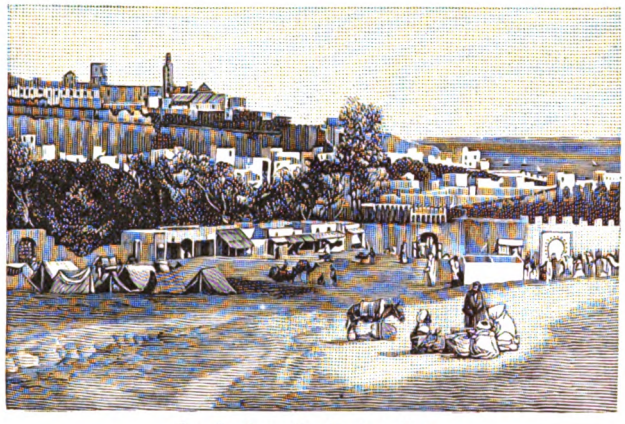
Tangent Compass. See GALVANOMETER.

Tangent Screw. One having a thread of small pitch, which connects a movable with a fixed plate; used to give a slow motion to the former.

Tangent Surfaces. Two curved surfaces are tangent when they have a common tangent plane at a common point.

Tanghin. Powdered seed of *Tanghinia venenifera*, an ordeal poison used in Madagascar. It produces death by paralysis of the heart. It owes its properties to tanghinin, which forms crystalline salts.

Tangier. Port of Morocco, 38 m. s.w. of Gibraltar; held by Portugal 1471–1663; ceded to England, as a part of the



Tangier from the Market-place.

dowry of the Queen of Charles II., and held till Feb. 1684. Outside of the town are the ruins of a Roman bridge and ab. 3 m. s.e. are the remains of ancient Tingis. Pop. ab. 25,000.

Tangle, Blue. In N. America, *Gaylussacia frondosa*, one of the Huckleberries.

Tangle, or Sea Tangle. Different varieties of sea-weeds, especially *Laminaria digitata*. It is used for food; in making iodine, and as uterine probes. That growing in N. America has been found unfit for the last purpose.

Tanhäuser. See Tannhauser.

Tanis. See Zoan.

Tanjore. Town of s. India, 180 m. s.s.w. of Madras. It has an old palace, a large temple or Pagoda (q.v.), and manufactures of silks, carpets, jewelry, and copper utensils. Pop., 1891, 54,060.

Tank Worm. Larval form of the Guinea Worm (q.v.), found in the E. Indian fresh waters.

Tannahill, Robert, 1774–1810. Scottish lyric poet.

Tanner, Benjamin, 1775–1848. American engraver.—His brother, Henry S., 1786–1858, pub. many maps and atlases.

Tanner, Henry S., M.D., b. ab. 1830. Subject of a noted experiment in fasting, in New York, June 28–Aug. 7, 1880.

Tanner, Thomas, D.D., 1674–1735. Archdeacon of Norwich 1710, Bp. of St. Asaph 1732; ed. Wood's *Athenæ Oxonienses*, 1721. *Notitia Monastica*, 1695–1744; *Bibliotheca Britannico-Hibernica*, 1748.

Tannhäuser, or Tanhauser. Bavarian knight and minnesinger; described in German legend as dwelling in the Venusberg, and then seeking pardon from the Pope; celebrated by Wagner in opera.

Tannic Acid, or Tannin. $C_{14}H_{10}O_9.2H_2O$. Numerous tannins of this composition exist in nature. The common tannin of the nut-galls, sumach, etc., is an amorphous mass, of astringent taste, soluble in water. Boiled with water it furnishes gallic acid, with ferric salts a dark-blue tannate of iron, and with gelatin an insoluble gelatinous precipitate. The latter property causes its use in tanning to convert the hide into an insoluble compound, Leather (q.v.). The tannic acids from other sources have like properties.

Tanning. See Leather.

Tansa. River of w. India, which supplies water to Bombay by an immense dam, completed 1892, 2 m. long, 118 ft. high, area ab. 8 sq. m., and supplies 100,000,000 gals. per day.

Tansillo, Luigi, 1510–1568. Italian poet.

Tansy. *Tanacetum vulgare*. Bitter, yellow-flowered herb of the Composite family, native of Europe; cultivated and introduced into America. It is a tonic. Cakes and puddings flavored with the leaves were formerly eaten in England at Easter, representing the bitter herbs at the Paschal feast.

Tansy (*Tanacetum vulgare*).

Tantalates. Derived from the metatantalic acid $HTaO_3$ and from the hexa-acid $H_8Ta_6O_{19}$.

Tantalic Acid. $HTaO_3$. Gelatinous mass, obtained by mixing the chloride with water; soluble in potassium binoxalate and hydrofluoric acid.

Tantalite. $(Fe,Mn)Ta_2O_6$. Mineral compound of iron, manganese, and tantalum, closely related to Columbite (q.v.), a compound of iron, manganese, and niobium. In nature these two compounds frequently occur together, and, being isomorphous, are often combined in the same individual crystal. Large masses have been found in the Black Hills region of S. Dakota.

Tantalum. Ta. At. wt. 182.6, sp. gr. 10.6, valence IV. V.; discovered by Hatchett 1801; rare metal, occurring in the minerals columbite and tantalite. It is prepared by fusing potassium fluotantalate with potassium. This gives a black powder which takes fire when gently heated. It is soluble only in hydrofluoric acid.

Tantalum Pentabromide. $TaBr_5$. Volatile substance similar to Tantalum Pentachloride (q.v.); made by treating a strongly heated mixture of the pentoxide and carbon with bromine vapor.

Tantalum Pentachloride. $TaCl_5$. Yellow needles or prisms, made by heating a mixture of the pentoxide and carbon in chlorine. It decomposes in the air to form tantalic acid. Compounds of tantalum and the other halogens are known; similar in composition and properties to the pentachloride.

Tantalum Pentafluoride. $TaFl_5$. Known only in solution; made by dissolving the pentoxide in hydrofluoric acid.

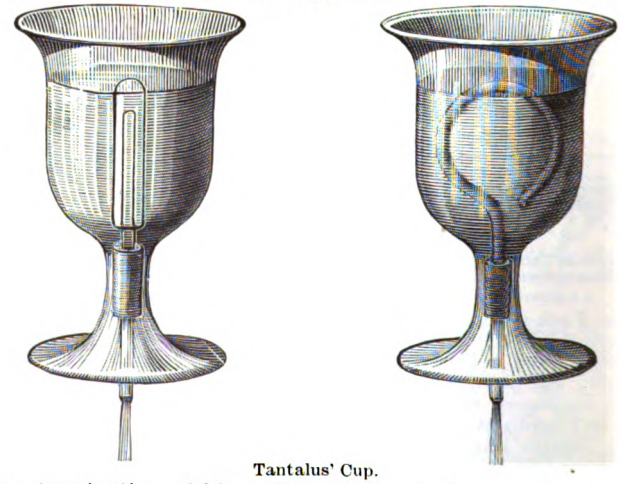
Tantalum Pentoxide. Ta_2O_5. White amorphous powder, which becomes crystalline on heating. It does not dissolve in any acid.

Tantalum Tetrasulphide. Ta_2S_4. Lustrous, brass-yellow substance, not attacked by hydrochloric acid; made by heating the pentoxide in carbon disulphide vapor.

Tantalum Tetroxide. Ta_2O_4. Porous grayish mass, made by heating the pentoxide in a carbon crucible in the blast furnace. It is not attacked by any acids.

Tantalus. Phrygian king, who for variously stated offenses was placed in a lake whose waters eluded his lips. Over his head hung branches of fruit which he could not reach, and a huge rock which menaced his safety.

Tantalus' Cup. If a siphon be placed in a cup, the longer leg passing water-tight through the bottom and the shorter



Tantalus' Cup.

one terminating within and very near the bottom, the whole may illustrate the action of an intermittent spring. If water

be made continually to drop into the cup, the cup will be filled to the top of the siphon tube, and then will be almost entirely emptied through the tube; this process is repeated indefinitely. If the siphon be concealed within the figure of a man whose mouth is just above the top of it, the water will continually rise nearly to his lips and then descend.

Tantum Ergo (So great therefore). Fifth and sixth stanzas of Thomas Aquinas' hymn *Pange Lingua*, Eucharistic hymn in the R.C. church.

Tanystomata. Tribe of *Muscaria*, including flies with a long proboscis with stylet-shaped jaws. The larvæ have hooked jaws inclosed in a sheath. Here belong the blood-sucking, stinging Gadflies.

Taoism. System of philosophy founded upon the teachings of a Chinese mystic, Lao-tse or Láu Tsz', ab.600 B.C.; also a native religion. In the former, the search for purity, virtue and tranquillity of mind was urged as conducive to absorption in the great principle of Táu, or Nature. The religion, as it exists to-day, has largely borrowed from Buddhism. Only its priests are considered as members of this sect. They are permitted to marry, and take charge of the temples of the state gods of China. A trinity called the Three Pure Ones, which may be regarded as manifestations of its founder, hold the first place in the Taoist pantheon.

Taormina. See Sicily.

Tapajos. River of central Brazil. It receives the Arinos and the Jaruena, and flows ab.900 m. n.n.e. to the Amazon.

Tape. Steel measure used by surveyors instead of the Chain (q.v.). Very accurate measurements of base lines can be made by a tape if the errors due to temperature, stretch and sag be taken into account, as can be done by computation.

Tape-Grass. See Eel-grass.

Taper-Pointed. See Acuminate.

Tapetum. Epithelial lining of the pollen-sac of flowering plants.

Tapeworm. See Botriocephalidæ, Cestoda, Cysticercus, Tæniadæ, and Tænia solium. Besides these, man is infested by the Pork-measle, Fish-measle, and Beef-measle, *Tænia saginata* or *Cysticercus bovis* of cattle. The last is $\frac{3}{8}$ of an in. long in its first stage and grows in man to ab. 20 ft., with over 1,200 segments, the last 200 of which may contain ripe eggs, that escape by pores at the edge of the worm, placed alternately on opposite sides in successive segments. This tapeworm has suckers, but no hooks. Careful meat inspection and proper cooking are the precautions needed to prevent the development of these parasites.

Tapioca. Starch (q.v.) from the root of the *Manihot palmata* and *M. utilissima;* prepared by pressing the roots under water. It is obtained in granular form by heating the meal upon plates. It is used as an article of food. The name is sometimes given to Sago (q.v.).

Tapiridæ. Family of *Perissodactyla*. See Tapirs.

Tapirodont Dentition. Form of molar teeth belonging to the antio-lophodont series, as seen in the upper jaw of the tapir, rhinoceros, and hyrax. In this the outer tubercular ridges on the crown are crescentic, compressed longitudinally, while the inner are transverse ridges, extending to the outer ones.

Tapirs. Odd-toed ungulates, resembling swine and living in Central and S. America and s.e. Asia; 3 toed, but front feet bear small fourth toes. They are crepuscular, feed on shoots, and are hunted for their hides. The largest is the Indian Tapir, 8 ft. long by over 3 ft. high, of a black color, girdled with a broad belt of white, which also extends back over the rump. Its upper jaw ends in a prehensile snout. The S. American Tapir is uniform grayish black, has an erect mane and short hair, but the young are born (one to each female) marked with white, after ab. 4 months' gestation. The female is the larger, and attains a length of 7 ft. In the high Andes is the Hairy Tapir (ab. 5 ft. long), with hair an inch long, and white markings. In Central America is a still smaller Tapir. The earliest fossil tapirs were no larger than rabbits.

Tapir (*Tapirus indicus*).

Tappa. Bark cloth of the South Pacific Islands, beaten by the natives from the bark of the paper mulberry, prepared by steeping, by means of wooden mallets. It constituted the chief article of dress among the Polynesians, and was usually ornamented by painted or stamped patterns. Although still made, the art has declined and the present manufacture is inferior to the ancient fabrics.

Tappan, Benjamin, 1773–1857. U. S. Judge for Ohio 1833; U. S. Senator 1839–45.—His brother, Arthur, 1786–1865, merchant and philanthropist, founded the *Journal of Commerce* 1828 and the *Emancipator* 1833, and was first pres. of the New York and American Antislavery Societies 1833–34.—His brother and biographer, Lewis, 1788–1873, was associated in these activities, and founded the first mercantile agency in the U. S.

Tappan, Henry Philip, D.D., LL.D., 1805–1881. Prof. Univ. New York 1832–38; Chancellor Univ. Mich. 1852–63. *Doctrine of the Will*, 1840–41; *Logic*, 1844–58.

Tappan, William Bingham, 1794–1849. American sacred poet.

Tapping. Surgical operation performed when it is necessary to evacuate the collected fluid of some internal organ, as in dropsies of the chest and abdomen. A small bayonet-like instrument covered with a tube, called a trochar and cannula, is thrust into the cavity, the trochar withdrawn and the fluid allowed to run out through the tube.

Taprobane. Ancient name of Ceylon.

Tap-Root. One which grows nearly vertically downward and becomes the largest and most important; generally the primary root, as in the Beet.

Taps. Sound of a trumpet or of three taps of a drum given shortly after tattoo as a signal to extinguish lights in camp or in quarters.

Tar. Thick viscid oleoresin, obtained by distillation of pine-trees and used for coating the planks and cordage of ships. It is produced wherever pitch pine grows, chiefly in S. C., Va. and Ga. Turpentine, pitch and rosin are manufactured in connection. The oily distillate of tar is called oil of tar.

Tarantass. Russian vehicle, consisting of a seatless boat-shaped body on wooden bars, carried on four wheels, and drawn by three horses abreast.

Taranto. Town of s. Italy, on the gulf; anciently Tarentum; founded 708 B.C. from Sparta; long rich and powerful; held by Rome from 272 B.C. At the end of the 10th century it was rebuilt by Nicephorus and again became a Greek town. It is sheltered by the isles of St. Peter and St. Paul, each having a lighthouse. It trades in olive-oil and shell-fish. Pop., 1891, 25,246.

Coin of Tarentum.

Taranto, Gulf of. Arm of the Mediterranean, extending into s. Italy.

Tarantula. Large spider, *Lycosa tarantula apuliæ* of Europe, fabled to cause tarantism, a mania like St. Vitus' dance; in America any mygalid spider.

Taraxacum. See Dandelion.

Tarbox, Increase Niles, D.D., 1815–1888. Sec. American Education Society 1815–84; author of juvenile and other books.

Tardigrada (Arctisca or Macrobiotidæ). Group of Arachnids of small size, aquatic, hermaphrodite, and without respiratory organs or heart. The body is vermiform, and bears a suctorial proboscis and four pairs of clawed, stumpy legs, the

last pair being at the posterior end of the body. These animals are popularly known as Water-Bears, and require a low-magnifying microscope to see them. They live on moist moss.

Tardigrada (SLOTHS). See BRADYPODIDÆ.

Tare. See VETCH.

Tare and Tret. Deductions made from gross weight of goods; allowance for the packing.

Tarentum. See TARANTO.

Target. Mark to aim at in shooting. They are of different kinds, as, self-marking, swinging, disappearing, and running man target, the latter consisting of a figure running on wires. See SHARPSHOOTER.

Targum. Aramaic versions of parts of O. T., credited to Onkelos, Jonathan ben Uzziel, and others, ab.100 and later.

Tarifa. Seaport of s. Spain, 21 m. s.w. of Gibraltar; named from Tarif, leader of Saracens, who landed there 710; taken from the Moors 1292, by them 1340, and by the French 1812. Pop. ab.13,000.

Tariff. Classified list of prices, charges, or rates; more specifically, rates of duty on various articles of importation. The first U. S. Congress passed a tariff act 1789, laying on import duties which averaged ab. 8 per cent. These were slightly increased 1790 and 1792. The tariff of 1816 imposed duties of ab. 25 per cent on some manufactures. In 1824 a new act was passed, raising the duties on metals and products of the soil. The "tariff of abominations," so called by its opponents, was passed 1828, laying duties on raw materials. That of 1832 returned nearly to the rates of 1824. Lower tariffs were enacted 1846 and 1857. The Morrill tariff, with its high protective duties, went into effect 1861: its rates were set still higher 1862 and 1864. Some reductions were made 1883. The McKinley act was passed 1890, strengthening the protective system, but removing the duty on sugar. This was succeeded by the Democratic tariff of 1894, which admitted many raw materials free, the most important of which was wool, but laid a duty on sugar: it effected also a slight lowering of the general schedule. The Dingley act, 1897, placed most duties higher than the act of 1894.

Tarif ibn Zeyad, or ABU ZORA. Moslem general, gov. of Tangier and n. Africa. He invaded Spain with 10,000 men, landing at Jabal-Tarik, or Gibraltar, and routed Roderick near Xeres. With Musa he conquered all Spain in less than 3 years, and returned to Damascus 713.

Tarlatan. Variety of thin cotton cloth, made in France and Switzerland.

Tarleton, SIR BANASTRE, 1754–1833. English major, in America 1776–81; noted in S. C. and N. C. for daring and ferocity, so that his name was a terror to children; victor in many raids and skirmishes; defeated by Sumter Nov. 20, 1780, and by Morgan at Cowpens Jan. 17, 1781; M.P. 1790–1806 and 1807–12; intimate with the Prince of Wales, and habitual critic of Wellington; Lieut.-gen. 1817, Baronet 1818. *Campaigns of 1780–81*, 1787.

Tarlton, RICHARD, d.1588. Famous clown.

Taro. Arenaceous plant, *Alocasia macrorhiza*, of Polynesia, the tops of which are used as pot herbs, and the roots, which contain considerable starch, as food.

Tarocchino. Tarot cards of Bologna; diminutive of tarocchi, any game with tarots. The pack consists of 62 cards, 22 tarots proper, and 40 numerals, the 2, 3, 4, and 5 of each numeral suit being suppressed. This modification of the tarots game was invented at Bologna by Fibbia ab.1420.

Tarots. Kind of European playing cards in which the ordinary numeral suits are supplemented by 22 numbered cards with emblematic devices, which are traced to certain old Italian prints known as the Tarocchi of Mantegna, not, apparently, originally for card games. The earliest of European cards, tarots are still played in Italy, France, and parts of Germany.

Tarpaulin. Cloth or canvas covered with tar or some other substance to make it waterproof.

Tarpeia. Roman maiden, who admitted the Sabines to the fortress on the Capitoline hill, of which her father was governor, on condition that she should receive what they bore on their left arms (meaning their gold bracelets), and was crushed under their shields, which they threw upon her. The Tarpeian rock was named from her.

Tarpon. *Megalops thrissoides.* Large fish reaching a length of 6 ft. and weighing 150 lbs., found off the Florida coast. In spite of its size, it is taken with rod and line, furnishing rare sport, as it is very game and a vigorous leaper.

Tarquinii. See CORNETO.

Tarquinius, LUCIUS PRISCUS. In Roman legends, king 616–578 B.C.—His son, SUPERBUS, became king 534: slighted the Senate and oppressed the people; was banished 510, because of rape of Lucretia by his son, and d. at Cumæ 495 B.C.

Tarragon. *Artemisia dracunculus.* Shrub of the Composite family, native of Siberia, cultivated in gardens for flavoring dishes.

Tarragona. Seaport of n.e. Spain, 60 m. w. by s. of Barcelona; anciently Tarraco; founded from Carthage; prominent under Roman rule; taken by the French 1811, by the British 1813. It has some manufactures and a large trade. Pop. ab. 27,300.

Tar River. Rapid river rising in N. C., flowing e.s.e. into Pamlico Sound. Its estuary for ab. 40 m. is called Pamlico River. Length 180 m.

Tarshish. Probably Tartessus in Spain; often mentioned in O. T. as a far distant port.

Tarsia-Work. Inlaying of geometrical figures in wood, practiced in Italy in the 16th century.

Tarsiidæ. Family of *Prosimiæ* (Lemurs), including but one species, Tarsius.

Tarsius. Lemur of Sumatra, Borneo, etc., with long jerboa-like hind legs, due to a long calcaneum. It has suction pads on the ends of its fingers and toes, and lives like a tree frog. The tail is long and tufted at the end; its ears and

Tarsius (*Tarsius spectrum*).

muzzle are short. The color is brownish-yellowish gray. The eyes are remarkably large. It feeds on insects and by night. There are only 2 lower incisors, and the middle upper incisors are developed beyond the others. It is 7 in. long, and shows some close affinities to human structure.

Tarso-Metatarsus. Lower leg of birds, formed by the union of the long metatarsals with the distal row of tarsal bones; usually called the tarsus.

Tarsus. Ancient capital of Cilicia; long the most important city of s.e. Asia Minor; seat of learning and center of commerce; birthplace of St. Paul. Pop. ab.30,000, but much less in summer.

Tarsus. 1. Group of seven bones, forming the ankle joint, articulating with the leg above and the foot below. 2. Cartilage of the eyelid, usually called the tarsal cartilage. Hence the inflammation at the edge of the eyelids is frequently called tarsal ophthalmia.

Tartaglia, NICCOLO FONTANA, 1500–1557. Teacher of mathematics in Venice; real author of the solution of cubic equations known as Cardan's Method. *Nova Scienza*, 1537; *Arithmetic*, 1556; *On Number*, 1560. *Works*, 1606.

Tartans. Scotch plaid of various patterns, made either of cotton, silk, or worsted, or a combination of two of these.

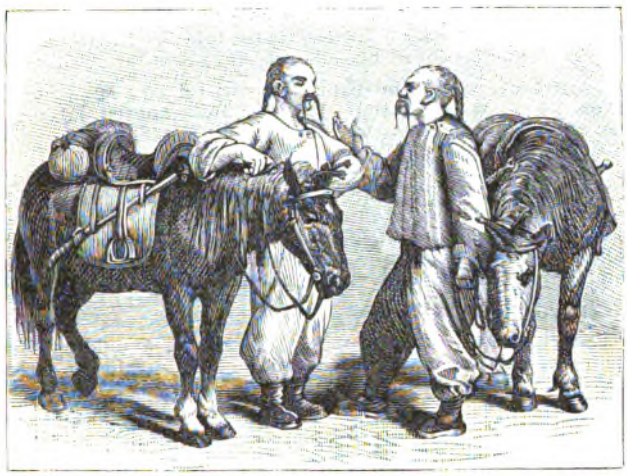
Tartar. See CREAM OF TARTAR.

Tartar Emetic. $C_4H_4O_6KSbO$. White salt, somewhat soluble in water; prepared by boiling a solution of cream of tartar in water with oxide of antimony. It is a tartrate of potassium and antimony. It is used in textile coloring, and in pharmacy: ¼ gr. reduces the pulse; larger doses act as an emetic; 10 grs. act as a poison. Tannic acid, as in tea or oak bark, is an antidote.

Tartaric Acid. $C_2H_2 \vdots (OH)_2.(COOH)_2$. Dibasic acid, known in four modifications. That found in fruits, in the juice of the grape, etc., from which it is prepared, is the dextrotartaric acid which rotates polarized light to the right. Laevotartaric acid rotates polarized light to the left. Paratartaric

acid, racemic acid, is a mixture of the laevo and dextro acids and is optically inactive. The meso acid is also inactive, but is not a mixture. The common or dextrotartaric acid is a crystalline solid, melting at 135° C.; prepared from tartar, and used in the preparation of fruit syrups. See CREAM OF TARTAR.

Tartars, or TATARS. Division of the Ural-Altaic Turanians, including those who invaded s. Russia, the Caucasus, and Turkey, in the 13th century, and also the remnants of related



Tartar Soldiers.

tribes of Siberia and w. central Asia. Cossacks, Kirghiz, and Turks are included. The name Tatar is derived from a more easterly tribe, which drove the others w., but it has been erroneously extended to include also such tribes as the Chinese Tartars and the inhabitants of Tartary. The Tatar branch has been admixed on all sides with other Turanian tribes, Finns, Samoyeds, Kalmuks, Mongolians, Magyars, etc. All are nomadic, except the Osmanli or Turks proper. They number a million or more in Russia, and as many in the Caucasus. Nearly all are Mohammedans, but with pagan and tribal customs retained.

Tartarus. In Mythology, abyss far below Hades; in later poets, Hades.

Tartary. Part of Turkestan; name loosely and variously applied, mainly to e. or central Asia.

Tartary, CHANNEL OF. N. arm of Japan Sea, between Saghalien and s.e. Siberia.

Tartini, GUISEPPE, 1692–1770. Italian violinist, composer and theoretician. His sonata, *The Devil's Trill*, has held its place in the repertory of most violinists. He composed it under the inspiration of a dream in which he heard the devil "play with consummate skill a sonata of such exquisite beauty as surpassed the boldest flight of imagination."

Tartrazine. $C_{16}H_{12}N_4O_{10}S_2Na_2$. Sodium salt of the compound formed by the action of phenylhydrazine sulphonic acid upon dihydroxy-tartaric acid ($COOH.C(OH)_2.C(OH.)_2COOH$); yellow powder, which dyes wool yellow.

Tartuffe. Religious hypocrite and impostor who uses religion as a means of gaining money, covering deceit, and promoting self-indulgences. So named from the chief character of a comedy by Molière.

Taschereau, ELZÉAR ALEXANDRE, b.1820. Abp. of Quebec 1871; Cardinal 1886.—His relative, HENRI ELZÉAR, b.1836, became Judge of the Supreme Court of Quebec 1871, and of that of the Dominion 1876. *Criminal Law for Canada*, 1874–88.

Taschereau, JULES ANTOINE, 1801–1874. Parisian journalist and librarian; editor of Molière, 1823; biographer of Molière and Corneille, 1825–29.

Tashkend. Capital of Russian Turkestan; city of Asiatic Russia, on the Saralka, a branch of the Sir Daria; independent till 1810, then held by Khokand till 1867. It has a large trade and some manufactures. Pop. ab.125,000.

Tasimeter. Instrument invented by Edison which detects changes of temperature by the variation of a current of electricity passing through a disk of soft carbon, fixed between metallic supports and exposed to varying pressure produced by temperature changes.

Tasman, ABEL JANSZOON, ab.1602–1659. Dutch voyager, discoverer of Tasmania and other islands 1642–43.

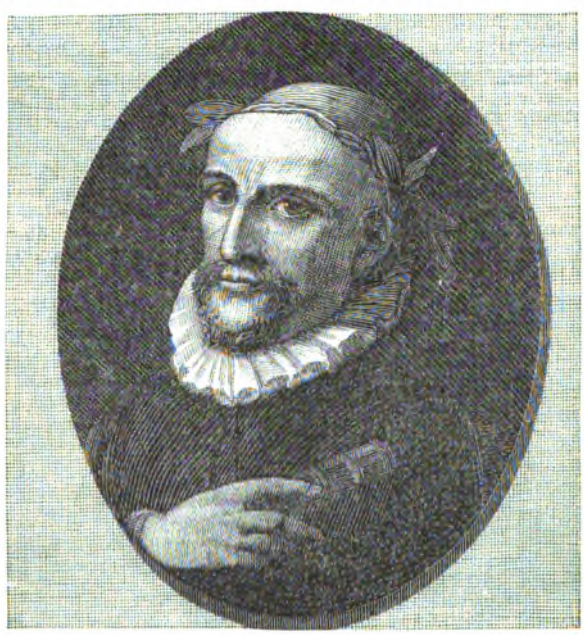
Tasmania. Formerly Van Dieman's Land; island s. of Australia, separated from it by Bass Strait, and belonging to Gt. Britain; discovered 1642; settled from Sydney 1803; penal colony 1804–53. Its extreme dimensions are in each direction ab.200 m., and its area 26,215 sq. m. Most of the island is a table-land, averaging 3,000 ft. in height, with mts. 4,000 to 5,000 ft. high in w. part. The products are chiefly agricultural. Gold, silver, copper, tin and coal are mined. Capital, Hobart Town, on the s. shore. Pop. ab.155,000.

Tasmanian Devil (DASYURUS URSINUS). Bear-like marsupial of Tasmania, ab. the size of a badger. It has a bushy tail, black coat with narrow white throat band, and two small shoulder spots; is nocturnal, carnivorous and untamable. The dentition is $\frac{4}{3}\,\frac{1}{1}\,\frac{3}{2}\,\frac{4}{4}$.

Tasmanians. The aborigines of this island in 1800 numbered ab. 7,000, but through wars were rapidly reduced: the last pure blooded native died 1876. They were related to the aborigines of Australia but contained admixture of Negrito blood. In civilization they ranked lower than the Australians, but they were timorous and chaste. Their only manufactures were weapons of bone, wood, and stone, the latter not equal to those made by Neolithic man. The average height was a little over 5 ft.

Tasman Sea. Sea between New Zealand and the islands to the n.w. on the one hand and Australia and Tasmania on the other.

Tasso, TORQUATO, 1544–1595. Italian poet, ranking next to Dante. His fame rests on *Jerusalem Delivered*, 1581, tr. by E. Fairfax 1600, and in much less degree on his pastoral drama, *Aminta*, 1573, and a youthful epic, *Rinaldo*, 1562. He lived at the court of Ferrara 1572–77, but became the victim of morbid delusions, and was confined in a madhouse 1579–86. His last production, *Gerusalemme Conquistata*, 1593, was unworthy of his genius. Death prevented his being crowned by the Pope.



Tasso.

His works were collected in 33 vols. 1821–32.—His father, BERNARDO, 1493–1569, was an epic and lyric poet of repute in his time.

Tassoni, ALESSANDRO, 1565–1635. Italian poet, essayist, and political writer. *Pensieri*, 1608–20; *Secchia rapita*, 1615–22.

Taste, SENSATIONS OF. Changes of consciousness aroused by stimulation of certain specific end organs, situated in the mucous membrane of the tongue and soft palate. The usual classification of tastes is, sweet, bitter, sour, salt, and possibly alkaline and metallic, though the latter two are not so well defined as the other four and may be only modifications of them. The physical condition of taste is that the substance to be tasted be soluble in the fluids of the mouth. The end organs of taste are small modified nerve endings, known as taste-buds, situated on small papillæ, and directly connected with the special nerves of taste. The mucous membrane of the tongue is also sensitive to impressions of touch and temperature, which are apt to be confused with tastes in the case of pungent, astringent, hot, or cold substances. Taste is also

commonly confused with smell. The so-called flavor of most edible substances is largely smell and not taste.

Tate, NAHUM, 1652–1715. Irish dramatist, poet laureate 1692; author, with N. Brady, of the *New Version of the Psalms*, 1696, long used in the Ch. of England and in America. This, with its *Supplement* of a few hymns, 1703, contains his best work.

Tateno Gozo, b.1841. Gov. of Osaka 1880–90; Japanese Minister to the U. S. 1890–94.

Tatham, WILLIAM, 1752–1819. Va. author. *Inland Canals*, 1798; *Tobacco*, 1800.

Tatian, ab.115–ab.180. Christian apologist, b. in Assyria; disciple of Justin Martyr. His *Ad Græcos* was written in Greek and probably at Rome; his *Diatessaron*, probably in Syriac, was the first attempt at a harmony of the Gospels, and was much used in Syria. His other works are lost. After 167 he became a Gnostic and returned to the East.

Tatius, ACHILLES. Alexandrian Greek romancer, probably of 3d century. *Leucippe and Cleitophon.*

Tatler. Tri-weekly founded and conducted 1709–11 by Sir R. Steele, to which he contributed essays.

Tatnall, JOSIAH, 1762–1803. U. S. Senator 1796–99; Gov. of Ga. 1800.—His son, JOSIAH, U.S.N. and C.S.N., 1795–1871, became Captain 1850, and as Commodore C.S.N. defended the waters of Va. 1861–62 and of Ga. 1863–65.

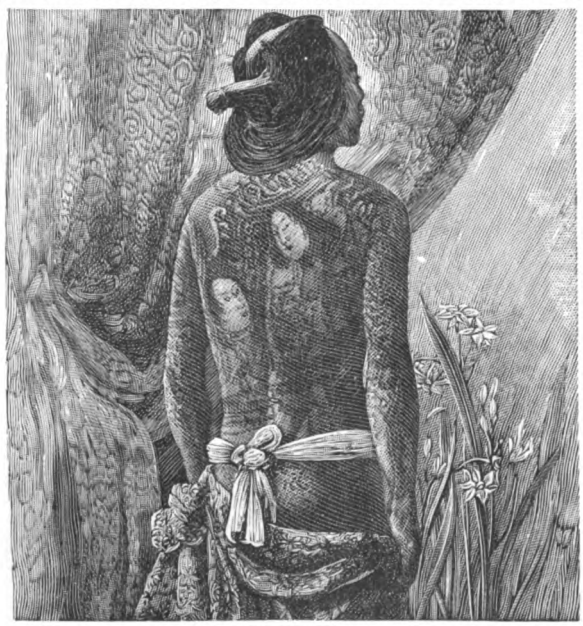
Tattam, HENRY, D.D., LL.D., F.R.S., 1788–1868. Archdeacon of Bedford 1844; author of a Coptic grammar and lexicon 1828–35; editor of Coptic versions of Job and the Prophets 1847–52.

Tattersall's. Horse-market in London, chiefly for racers; founded 1766 by Richard Tattersall, 1724–1795.

Tattlers (TELL-TALES, SANDPIPERS, etc.). Plover-like birds with slender, straight, stiff, sharp bills and long legs. Yellow Shanks has yellow legs; the Solitary Tattler has blackish ones; the Semipalmated Tattler has its toes webbed at the base.

Tattoo. Sound of the trumpet or the music of the fife and drum at the close of the evening: a signal to the troops to attend roll-call preparatory to going to bed in camp or garrison.

Tattooing. This widespread primitive custom appears to have originated in the desire to fix permanently the various devices painted upon the human skin as family and tribal designations, and for ceremonial and religious purposes. It now exists especially among the natives of the Pacific Islands and s.e. Asia, in S. America, and in n. Africa. Among the black-



Japanese Tattooing.

skinned races it is replaced by scarification. The implements for it consist of a needle or chisel of bone or iron, which is often forced under the skin with a small hammer, and ink of one or more colors. The operation is extremely painful. Tattooing is disapproved by civilized races, and in Japan, where the art has reached great perfection, it is the subject of legislative enactments. In modern times, tattooing is practically confined to savages, sailors, criminals, and vagrants.

Tauchnitz, KARL CHRISTOPH TRAUGOTT, 1761–1836. Printer at Leipzig 1796; publisher of superior editions of Greek and Latin classics from 1809; introducer of stereotyping 1816; succeeded by his son, KARL C. P., 1798–1884.—His nephew, CHRISTIAN BERNHARD, BARON, 1816–1895, founded 1837 a yet more famous house in Leipzig, and from 1831 pub. ab. 3,000 English books. He was ennobled 1860, and made a Saxon Peer 1877.

Tauler, JOHANNES, ab.1300–1361. German mystic, Dominican monk, and famous preacher. His sermons were pub. 1498; 25 were tr. 1857.

Taunay, ALFREDO D'ESCRAGNOLLE, b.1843. Brazilian novelist, poet and critic; of French ancestry; Senator 1886.

Taunton. City and capital of Bristol co., Mass., on T. River, 34 m. s. of Boston. Its industries consist largely in iron and steel manufactures. Pop., 1890, 25,448.

Taurecs. See CENTETIDÆ.

Taurine. $NH_2.C_2H_4.HSO_3$. Amidoethylsulphonic acid; mpt. 240° C.; white crystalline compound, soluble in hot water; found in combination in considerable quantities in the bile, kidneys, etc., of oxen and other animals; made by treating chlorethylsulphonic acid with ammonia.

Taurus. See ZODIAC.

Taurus Mts. Range of e. Asia Minor, extending from the frontier of Transcaucasia s.w. to the Mediterranean. Greatest height ab. 10,000 ft.

Tausig, KARL, 1841–1871. Polish-German pianist and composer, pupil of Liszt; unsurpassed as a technician.

Taussig, FRANK WILLIAM, b.1859. Prof. Harvard 1887. *Tariff Hist. U. S.*, 1888; *Silver Situation*, 1892.

Tautog. See LABRIDÆ.

Tautphœus, BARONESS JEMIMA VON, 1808–1893. English novelist of Irish birth (b. Montgomery), resident in Bavaria. *The Initials*, 1850; *Cyrilla*, 1853; *Quits*, 1857; *At Odds*, 1863.

Tavern. Public house where both food and drink are sold. See HOTEL.

Tavernier, JACQUES, ab.1625–1673. French buccaneer, executed at Havana.

Tavernier, JEAN BAPTISTE, 1605–1689. French traveler in Asia. *Six Voyages*, 1676, repub. in 7 vols. 1810; *Travels in India*, tr. 1890. His specialty was precious stones.

Tavsen, HANS, 1494–1561. Leader of the Reformation in Denmark; Bp. of Ribe 1542.

Tawing and Tanning. See LEATHER.

Tax. Public burden imposed generally on the inhabitants of a community, for governmental purposes; to be distinguished from an assessment for local improvements. It is not a lien on property unless made so by statute. The methods of imposing and collecting, including the sale of personal and real property for delinquent taxes, are regulated by statute.

Taxeopoda. Order of placental Mammals, forming a connecting link between the *Bunotheria* and the true Ungulates (*Diplarthra*). The toes are hoofed: the two series of bones in the carpus and tarsus are placed so that each member of the proximal row articulates with but one member of the distal row (a primitive arrangement). The suborders are *Condylarthra*, *Taxodontia*, and *Hyracoidea*.

Taxidermy. Art of preparing and arranging the skins of animals intended for preservation in such a manner as to represent their natural appearance. The skin after its removal is rubbed with some preservative, as arsenious acid alone or mixed with alum, and a framework, with wires running to the different extremities of the body, is inserted. Cotton is then placed around the framework, and wires to fill the skin give the required shape. Butterflies and other insects are kept in close drawers in which camphor or petroleum is placed to preserve them and keep off moths.

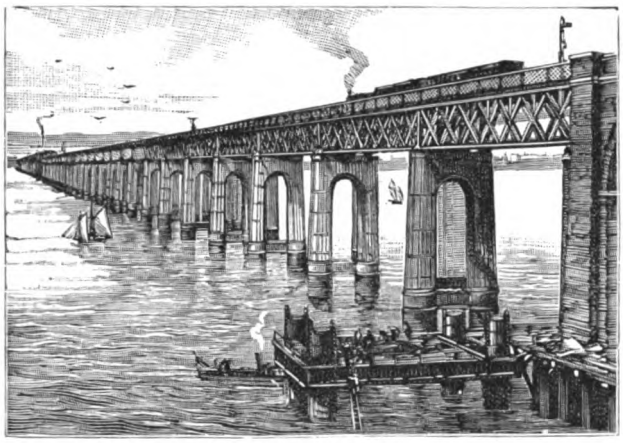
Taxis. When any prolapsed organ, *e.g.*, the bowel in a hernia, is replaced by manipulation without the aid of instruments, the operation is known as taxis.

Taxonomy. Systematic arrangement (classification) of living beings. Its object is to make the general distribution of animals and plants conformable to the order of nature in their production.

Tax Sale. Sale of property of a delinquent taxpayer, made by authority of law, as a means of collecting or enforcing an unpaid tax. Power to make such sales is statutory.

Tay. River of Perthshire, largest in Scotland; flowing 118 m. e. and s.e. to the North Sea.

Tay Bridge. Built 1871, consisting of 85 spans with a total length of 10,320 ft. On the stormy night of Dec. 28, 1879, 13 spans fell into the river, and with them a passenger train containing 72 persons, all of whom perished. The cause of the



Tay Bridge, Scotland.

failure was the insufficient bracing of the structure against the action of wind. A new bridge was completed 1887, in length 10,780 ft, costing $3,200,000.

Taygetus. Mt. range of s. Greece, extending ab. 70 m. s. to Cape Matapan.

Tayler, JOHN JAMES, 1798–1869. Prof. New Coll., Manchester, 1840, and its head 1853. *Religious Life of England*, 1845; *Faith and Duty*, 1851; *Fourth Gospel*, 1867; *Letters*, 1872.

Taylor, ALFRED, U.S.N., 1810–1891. Captain 1862, Commodore 1866, Rear-admiral 1872.

Taylor, ALFRED SWAINE, M.D., F.R.S., 1806–1880. Prof. Guy's Hospital, London; ed. *Medical Gazette*. *Medical Jurisprudence*, 1843–65; *Poisons*, 1848.

Taylor, BAYARD, 1825–1878. American traveler, poet, journalist, and novelist; Minister to Germany 1877. Beginning with *Ximena*, 1844, and *Views Afoot*, 1846, he produced many volumes of travel and of verse, and four novels, *Hannah Thurston*, 1863; *John Godfrey's Fortunes*, 1864; *Kennett*, 1866; and *Joseph and his Friend*, 1870. His chief ambition was poetical, and his chief success the translation of *Faust*, 1870–71. *The Masque of the Gods*, 1872, and *The Echo Club*, 1876, though not popular, are more memorable than his longer poems, *The Picture of St. John*, 1866, *Lars*, 1873, and *The Prophet*, 1874.—His wife, MARIE (HANSEN), b.1829, edited and tr. into German several of his works, and with H. E. Scudder wrote his *Life*, 1884.

Taylor, BENJAMIN FRANKLIN, LL.D., 1819–1887. American journalist, lecturer, and poet. *Theophilus Trent*, 1887.

Taylor, BROOK, F.R.S., 1685–1731. English mathematician. *Methodus Incrementorum Directa et Inversa*, 1715; *Linear Perspective*, 1719.

Taylor, DAN, 1738–1816. English preacher, founder and leader of the General Baptist New Connection 1770.

Taylor, EDWARD THOMPSON ("FATHER TAYLOR"), 1793–1871. M.E. missionary to sailors in Boston; noted for wit, eloquence, and efficiency.

Taylor, GEORGE, 1716–1781. Iron-master near Easton, Pa.; delegate to Congress 1776–77; signer of the Declaration of Independence.

Taylor, HANNIS, b.1852. U. S. Minister to Spain 1893. *Origin and Growth of English Constitution*, 1892.

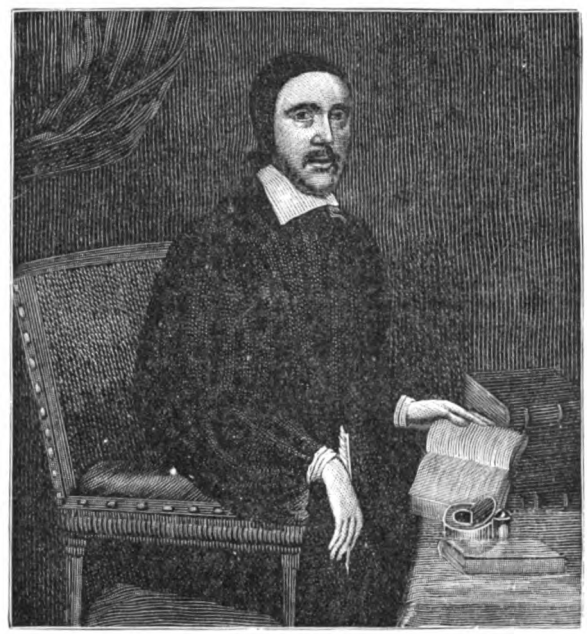
Taylor, SIR HENRY, D.C.L., 1800–1886. English poet, dramatist, and essayist; clerk in the Colonial Office 1824–72; knighted 1869. *Philip van Artevelde*, 1834, is his best play. *The Statesman*, 1836; *Notes*, 1847–49; *Autobiography*, 1885; *Correspondence*, 1888. *Works*, 5 vols., 1878.

Taylor, ISAAC, 1759–1829. Independent minister at Ongar in Essex from 1811; author of some 20 vols.—His daughter, JANE, 1783–1824, wrote *Contributions of Q. Q.*, 1826, and with her sister ANN (MRS. GILBERT), 1782–1866, the long popular *Original Poems*, 1805, and *Hymns for Infant Minds*, 1809.—Their brother, ISAAC, LL.D., 1787–1865, pub. *Natural History of Enthusiasm*, 1829, and *of Fanaticism*, 1833; *Spiritual Despotism*, 1835; *Physical Theory of Another Life*, 1836; *Ancient Christianity and the Oxford Tracts*, 1839; *Wesley and Methodism*, 1851; and other books.—His son, ISAAC, LL.D., b.1829, Canon of York 1885, has pub. *Words and Places*, 1864; *Taylor Family of Ongar*, 1867; *Greeks and Goths*, 1879; *The Alphabet*, 1883; *Origin of the Aryans*, 1890.

Taylor. ISIDORE SÉVERIN JUSTIN, BARON, 1789–1879. French writer of books of travel; Senator 1869.

Taylor, JAMES HUDSON, b.1832. English missionary in China 1853–60 and since 1866; founder of the Inland Mission 1865.

Taylor, JEREMY, D.D., 1613–1667. Bp. of Down and Connor 1660; most brilliant of Anglican writers; called by Emerson "the Shakespeare of divines." His *Liberty of Prophesying*, 1647, is a powerful argument against persecution. More popu-



Jeremy Taylor.

lar were his *Great Exemplar* (Life of Christ), 1649, and *Holy Living and Dying*, 1650–51. His few hymns are in *Golden Grove*, 1655. *Ductor Dubitantium*, 1660, is an immense book on casuistry. His works were collected in 15 vols. 1820–22.

Taylor, JOHN, 1580–1654. English "water" poet. His works were collected 1630 and repub. 1868–78.

Taylor, JOHN, LL.D., 1703–1766. Canon of St. Paul's 1757; editor of Lysias, 1739, and other Greek orators.

Taylor, JOHN, 1750–1826. English hymnist.

Taylor, JOHN, 1808–1887. Mormon apostle 1838; long missionary in Europe; Brigham Young's successor as pres. 1877; indicted for polygamy 1885, and thenceforth in hiding.

Taylor, JOHN LOUIS, 1769–1829. Judge N. C. Superior Court 1798; Chief-justice from 1808; reviser of N. C. statutes 1817. *Cases*, 1802; *Reports*, 1818; *Executors*, 1825.

Taylor, JOHN W., 1784–1854. M.C. from N. Y. 1813–33; Speaker 1820–21 and 1825–27.—His nephew, JOHN ORVILLE, 1807–1890, was prof. Univ. New York 1837–52, and a writer on education.

Taylor, MARY CECILIA (MRS. W. O. EWEN), 1827–1866. American actress.

Taylor, NATHANIEL WILLIAM, D.D., 1786–1858. Prof. Yale from 1822; author of the "New Haven theology," a mitigated form of Calvinism, which exerted great influence and caused much commotion in New England. *Works*, 4 vols., 1858–59.

Taylor, PHILIP MEADOWS, 1808–1876. English officer, in India 1826–66; author of *Confessions of a Thug*, 1839; *Tara*, 1863; *Secta*, 1873; and other romances. *Cromlechs*, *Cairns*, etc., 1853; *Hist. India*, 1870; *Story of my Life*, 1877.

Taylor, RICHARD COWLING, 1789–1851. English geologist, in the U. S. from 1830; surveyor of Pa. coal fields. *Fossil Fuel*, 1841; *Statistics of Coal*, 1848.

Taylor, ROWLAND, LL.D., d.1555. Martyr of the Reformation; chaplain to Cranmer; Archdeacon of Exeter; burned, after a year's imprisonment.

Taylor, SAMUEL HARVEY, LL.D., 1807–1871. Principal of

Phillips Academy at Andover, Mass., from 1837; editor of classical text-books.

Taylor, THOMAS, 1758–1835. English Platonist; translator of Plato, 1804, Aristotle, 1806–12, the Neo-platonists Iamblichus, Porphyry, Plotinus, Proclus, and other Greek writers.

Taylor, THOMAS RAWSON, 1807–1835. English hymnist.

Taylor, TOM, 1817–1880. English playwright; ed. *Punch* 1874.

Taylor, WILLIAM, 1765–1836. English author and translator. *Synonyms*, 1813; *German Poetry*, 1828–30.

Taylor, WILLIAM, D.D., b.1821. M. E. bp. for Africa 1884; prolific writer.

Taylor, WILLIAM MACKERGO, D.D., LL.D., 1829–1895. Pastor in Scotland, at Liverpool, and 1872–93 in New York; author of Scripture biographies and other works. *Knox*, 1885; *Parables*, 1886; *Miracles*, 1890.

Taylor, WILLIAM ROGERS, U.S.N., 1811–1889. Captain 1862; active on the Atlantic coast; Commodore 1866, Rear-admiral 1871.—His father, WILLIAM VIGNERON, U.S.N., 1781–1858, became Captain 1841.

Taylor, ZACHARY, U.S.A., 1784–1850. Twelfth Pres. U. S.; Captain 1810; defender of Ft. Harrison, Ind., 1812; Major 1816, Colonel 1832; distinguished in the Black Hawk war, 1832, and against the Seminoles, Fla., 1836–38; victor at Okechobee, Dec. 25, 1837; commander on the Texas frontier 1845, and in the Mexican war 1846; victor at Palo Alto May 8, Resaca de la Palma May 9, and Monterey Sept. 21–24; Major-gen. June 1846; weakened by transfer of his best troops to Gen. Scott, yet victorious at Buena Vista Feb. 23, 1847; popular and fa-

Zachary Taylor.

mous as "Old Rough and Ready"; Whig candidate for Pres. June 1848; elected by plurality over Cass and Van Buren. His brief administration is memorable for the admission of Cal. as a free state, the struggle over the extension of slavery, and the Clay compromise.—His son, RICHARD, 1826–1879, a brilliant and accomplished man, became Brig.-gen. C.S.A. 1861, Major-gen. 1862, and Lieut.-gen. 1864, serving in the southwest, and fighting Gen. Banks in two battles, April 8–9, 1864. He pub. *Destruction and Reconstruction*, 1879.

Taylor, MT. Volcanic peak in w. New Mexico. Altitude 11,391 ft.

Taylor's Theorem. Formula, devised 1715 by BROOK TAYLOR (q.v.), for developing a function of the sum of two variables in a series of the ascending powers of one variable with coefficients which are functions of the other.

$$f(x+y)=f(x)+f'(x)y+f''(x)\frac{y^2}{\lfloor 2}+\ldots f^{n-1}(x)\frac{y^{n-1}}{\lfloor n-1}+ \left.\begin{array}{l} f^n(x+\theta y)\frac{y^n}{\lfloor n} \text{ or} \\ f^n(x+\theta y)\frac{(1-\theta)^{n-1}y^n}{\lfloor n-1} \end{array}\right\}$$

Tazewell, HENRY, 1753–1799. Judge Va. Supreme Court 1785–93; U. S. Senator from 1794.—His son, LITTLETON WALLER, 1774–1860, was M.C. 1801–3, U. S. Senator 1825–33, and Gov. of Va. 1834–36.

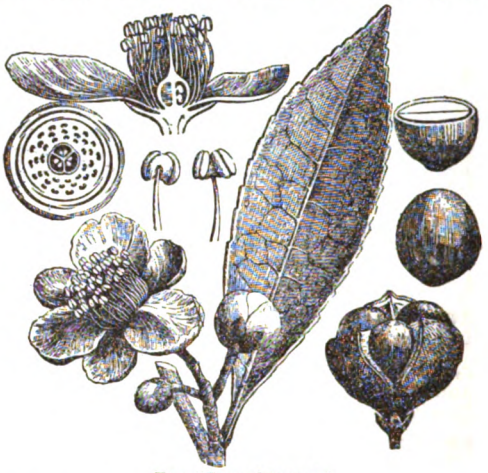
Tchelynskin, CAPE. Northernmost point of the mainland of Asia, lat. 78°.

Tcherevin, d.1896. Russian general, prominent against the Poles 1863 and the Turks 1877; head of secret police 1878–80.

Tchernaya. River in Crimea, scene of a battle Aug. 16, 1855. The Russians, under Gortschakoff, were repulsed with loss of 5,000 killed and wounded and 600 prisoners; loss of allies, 1,200.

Tchernyshevsky, NIKOLAI GAVRILOVITCH, 1828–1889. Russian economist, sent to Siberia for life 1864, after two years' imprisonment, during which he wrote a novel, *Que Faire?* It exerted a deep influence in Russia, and was tr. 1886 as *A Vital Question*.

Tea. Shrubs of the genus *Thea*, of the natural family *Ternstromiaceæ*, natives of e. Asia, extensively cultivated



Tea (*Thea chinensis*).

for their leaves. The leaves of numerous other plants have been used as substitutes. It contains 2.57–4.89 per cent of THEINE (q.v.), the active principle. Tea is supposed to have originated in Assam, thence been introduced into China ab.400, and from China into Japan ab.850. It was brought to Europe by the Dutch 1610, and was sold in England at $30 to $50 a pound; in 1666 the price had fallen to $15. It began to be cultivated in India 1834, in Ceylon 1876. Gt. Britain and Ireland in 1894 consumed 214,000,000 lbs.; the U. S. in 1896 imported 93,998,372 lbs. The consumption in the U. S., 1897, was 1.55 lbs. per capita. Production in 1888, in millions of pounds, was estimated, China 290, India 90, Japan 40, Ceylon 19, Paraguay 10, Java 7.

View in the Black-Tea District of China.

Tea, PARAGUAY. See MATÉ.

Teaberry. See WINTERGREEN.

Teachers' College. At Morningside Heights, New York; founded 1887, chartered 1892. It has 11 professors, 40 assistants, and ab. 350 students; it was made the school of pedagogy of Columbia Univ. 1897.

Teachers' Institutes. Begun in the U. S. 1843, with informal precedents from ab.1834.

Teaching of the Twelve Apostles. Greek MS., discovered 1873 at Constantinople by Bp. Bryennios; pub. 1883, tr. 1884. As perhaps the earliest Christian document outside the N. T. canon, it is of great importance for the light it casts on primitive church usages.

Teak. *Tectona grandis.* Large tree of the natural family *Verbenaceæ*, native of India, yielding a very hard and durable wood, used in shipbuilding. Sp. gr. 5.85.

Teal. Ducks of several species in U. S. and Europe.

Tear. In Botany, resinous or gummy exudation from a plant in the form of a teardrop.

Tear Gland. See LACHRYMAL GLAND.

Tears. Secretion of the lachrymal gland. They assist in lubricating the eyeball, and strong emotions and odors produce an excessive flow, especially in the human race, but few animals shed tears at all. The normal discharge escapes through the nose. Tears are of alkaline reaction, have a saline taste, and consist of water and ab. 1 per cent common salt.

Tears of Strong Wine. Phenomenon first explained by Prof. J. Thomson. The alcohol evaporating from a layer of wine on the sides of a glass causes an increase of the surface tension at points where the evaporation is most rapid. The remaining liquid is thus drawn up in drops, the motion always taking place from the stronger wine to the weaker.

Tear-Thumb. Prickly, climbing herbs of the genus *Polygonum;* especially *P. sagittatum* and *P. hastatum*, natives of N. America.

Teasel. Coarse herbs of the genus *Dipsacus*, natural order *Dipsaceæ*, with lavender-colored flowers subtended by a prickly or spiny involucre; natives of the Old World, introduced into America. *D. fullonum* is cultivated for its dense flower heads, furnished with recurved bristles, and used by fullers in raising the nap on woolen cloth. Its cultivation is a local industry of some importance in parts of Onondaga co. and Cayuga co., N. Y., the headquarters of the trade being at Skeneateles. The plant also grows wild in many parts of the country as a wayside weed.

Fuller's Teasel (*D. fullonum*): *a*, a bract.

Teche Bayou. Large bayou of the Mississippi River in La., issuing from the Atchafalaya Bayou to the s. of lat. 31° N., and flowing into the s. end of Grand Lake.

Technical Schools. These are schools of applied science in distinction from industrial schools, which latter instruct in handicraft, as carpentry, blacksmithing, etc. They include civil, mechanical, mining, electrical and chemical engineering, industrial chemistry, metallurgy and architecture. The Rensselaer Polytechnic Institute at Troy, N. Y., established 1824, was the first in the U. S. The Sheffield Scientific School at New Haven was founded in 1847, Lawrence Scientific School at Cambridge, Mass., in 1847, Chandler Scientific School at Dartmouth Coll. in 1852, School of Mines of Columbia Coll., N. Y., 1864, the Lehigh Univ., Bethlehem, Pa., 1866, Stevens Institute 1871, Mass. Institute of Technology, and many others.

Technology. Science of the industrial arts, as brewing, spinning, calico-printing, etc.: a general name for industrial science. See INDUSTRIAL SCHOOLS and TECHNICAL SCHOOLS.

Tectibranchiata (PALLIATA). Suborder of *Opisthobranchiata*, including forms having the gill on the right side, in a special cavity or covered by the mantle-edge. A shell is usually present, though it may be concealed, as in *Aplysia*, by lobes of the foot. There are two groups, *Phyllidiobranchia* (*Phyllidiidæ*) and *Ctenobranchia* (*Bulla*, *Aplysia*, Sea-Hare).

Tectology (COMPARATIVE ANATOMY, or MORPHOLOGY). Study of the relations and development of animal units, of grades above the antimere (see INDIVIDUALITY): includes Histology, Organology, Blastology, Prosopology, and Cormology.

Tectonic. In Geology, structural arrangement of the materials of the earth considered as a whole.

Tectospondyli. See SHARKS.

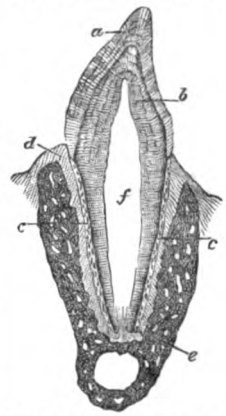
Tectrices (COVERTS). Short feathers overlapping the bases of the remiges of the wing of birds.

Tecumseh, ab. 1768–1813. Shawnee chief: with his brother, ELSKWATAWA, "the Prophet," he sought to form an alliance of the western tribes against the whites, and in the battle of Tippecanoe, Nov. 7, 1811, was defeated by Gen. Harrison. In 1812 he joined the British, was made Brig.-gen., and was killed at the Thames.

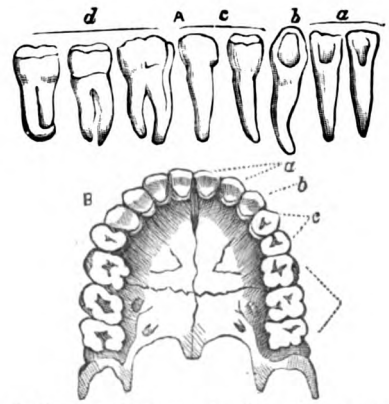
Te Deum. Latin hymn of 5th century, perhaps based on a Greek original; valued as the noblest of Christian poems, and in universal use; sung as part of Morning Prayer and on special occasions of thanksgiving. The legendary ascription to Ambrose and Augustine is unsupported. See AMBROSIAN HYMN.

Teeswater. See CATTLE.

Teeth. Principal organ of mastication: bony bodies placed in sockets in the upper and lower jaws. In man (and most mammals), there are two sets: the first, the milk or temporary teeth, 20 in number, appear in the first three years of life, beginning with the central incisors at from the 6th to the 8th month and ending with the last molar at from the 20th to the 30th month. The permanent teeth number 32, arranged symmetrically 8 on each side in the upper and lower jaw. Beginning in the middle, we have in succession: 2 incisors, 1 canine, 2 bicuspids and 3 molars; the last molar is often but imperfectly developed. The shedding of the temporary teeth begins after the 5th year, when they are replaced by the permanent.



Vertical Section through a Tooth lodged in its socket: *a*, enamel; *b*, dentine; *c*, crusta petrosa, or cement; *d*, lining of the cavity in the gum; *e*, bony socket in gum; *f*, pulp cavity.



A, the separate human teeth as they occur in the half-jaw of the adult; B, the human teeth *in situ* in the upper jaw; *a*, *a*, incisors; *b*, *b*, canines; *c*, *c*, premolars; *d*, *d*, true molars.

The permanent teeth appear in the following sequence: the 1st molar, the central and lateral incisors, the 1st and 2d bicuspids, the canine and the 2d and 3d molars. This last seldom appears before the 17th or 18th year, and is known as the wisdom tooth. The upper canines are sometimes called the eye-teeth; the lower, the stomach teeth. See DENTITION.

Teething. Process of eruption or cutting the teeth. The teeth are developed in the sockets, and, as they grow, are pushed up through the gum. This pressure is apt to cause great pain, with constitutional disturbances of more or less severity caused by the irritation. This, in part, accounts for the added dangers in the second summer of a child's life.

Teeth of Wheels. See GEAR WHEELS.

Teetotalism. Total ABSTINENCE (q.v.) from intoxicating drink.

Teetotum, or SPINNING DIE. Common gaming implement usually having four or six faces, which are marked either with letters, numbers, or dots like dice. Among German Jews, one marked with Hebrew characters is used in the sports of the children at the Feast of Purim. In India, one (chukree) with six dotted sides is permitted at the Diwali Festival. The Chinese implement, ch'é mé, is apparently borrowed from India. In Japan it is called Coma, and used in the popular game of Sugoroku or Double Sixes.

Tegern See. Mountain lake in s. Bavaria, 30 m. s.e. from Munich, 3½ m. long; it is frequented as a summer resort.

Tegmen, or ENDOPLEURA. Inner seed-coat of flowering plants, resulting from the ripening of the secundine coat of the ovule.

Tegmina. ELYTRA (q.v.) of the Grasshopper, etc.

Tegnér, ESAIAS, 1782–1846. Swedish poet, called the "greatest of the Gothic School"; prof. Lund 1812, Bp. of Wexio 1824. *Svea*, 1811; *Axel*, 1821; *Frithiof's Saga*, 1825.

Tegucigalpa. Capital of Honduras, 125 m. e. by n. of San Salvador. Seat of Congress since 1880. Pop. ab. 18,000.

Tegulæ. Two small scales of the mesothorax, projecting over the bases of the wings in insects (Hymenopters).

Teheran. Capital of Persia; near the Elburz Mts., ab. 70 m. s. of the Caspian Sea. Pop. ab. 160,000 in winter; early in spring the wealthier citizens go to the mts. Its trade and manufactures are considerable. The mosques have colleges attached to them, and the king's college has European professors.

Tehcult Indians. See PATAGONIANS.

Tehuantepec, ISTHMUS OF. Narrowest part of N. America, in s. Mexico. Width 134 m. An inter-oceanic canal, and more recently a ship railway, have been projected across it. The Gulf of Tehuantepec is on its s. or Pacific side.

Teignmouth, JOHN SHORE, BARON, 1751–1834. Anglo-Indian official; Baronet 1792; legislator of Bengal; Gov.-gen. of India 1793–97; Baron 1797; Privy Councilor 1807; editor and biographer of Sir William Jones.

Teinds. Scottish tithes, secularized at the Reformation, and now chargeable on rents for support of the Kirk.

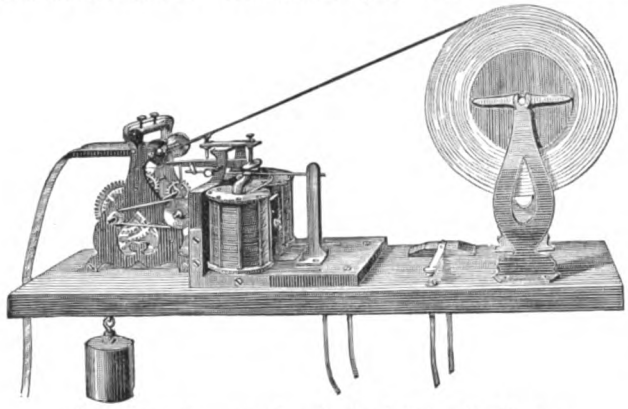
Teisias. True name of STERICHORUS (q.v.).

Tejeda, JUAN DE. First Captain-gen. of Cuba, 1589-95.

Telamon. In Etruria, Italy: here the Gauls, hemmed in by two Roman consular armies, were annihilated 225 B.C.; 10,000 were taken prisoners, and 40,000 killed.

Telautograph. Electrical device invented by Elisha Gray for transmitting autographs or copying designs. It is an ingenious application of the general principles of Morse's telegraphic alphabet.

Telegraph. The first electric telegraph, 13 m. long, was built in England 1839. The first overground line, on poles, was built at Calcutta 1839. The first in the U. S., between Baltimore and Washington, was completed May 1844, using Morse's system, of which a working model had been made 1836. In 1897 the telegraph systems of the world had an extent of ab. 5,000,000 m. An attempt to lay a cable across the Atlantic was made 1857; another was landed Aug. 5, 1858, but ceased to work within a month: the first which proved a success was landed in Newfoundland July 27, 1866. See TELEGRAPHY.



Morse Apparatus as used on the line between Washington and Baltimore.

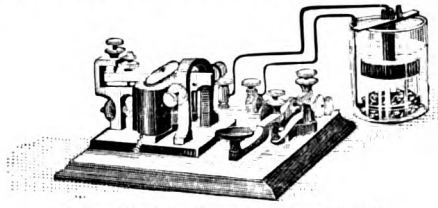
Telegraph and telephone companies are not common carriers, but their business is impressed with a public interest, so that the State may authorize them to exercise the right of eminent domain and may regulate their charges. They are bound to serve the public without discrimination, and generally to send messages for which payment is made or tendered in the order of reception. They are liable to the sender for damages sustained by their negligence in transmission and delivery, and in some jurisdictions they are liable to the receiver. In some States they may limit such damages by contract stipulation, in others such stipulations are deemed void, as against public policy.

Telegraph, FIELD. During the last years of the Civil War the headquarters of an army were often connected with those of its important subdivisions and of its supply stations in rear by means of a light telegraph wire through which direct and rapid communication could be maintained even during battle. The wires were on rolls, carried in light-wheeled vehicles, and could be rapidly paid out: they were supported on light poles or lances or on trees with suitable insulation. The system has been carefully and thoroughly developed, and is now part of the duty of the signal corps of the army.

Telegrapher's Cramp. Form of NEUROSES (q.v.).

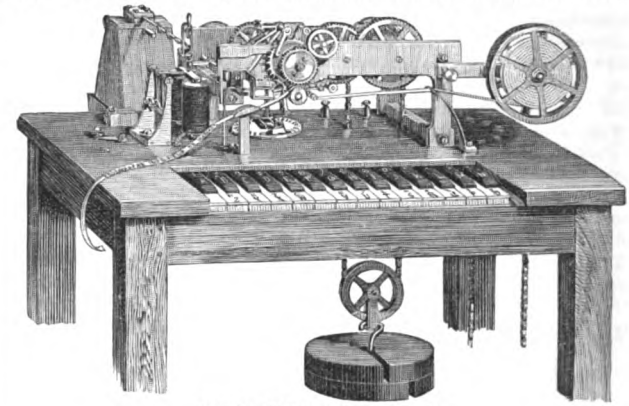
Telegraph Plant. *Meibomia gyrans.* Herbaceous plant of the natural family *Leguminosæ*, which exhibits a remarkable system of spontaneous movements of its lateral leaflets.

Telegraphy, ELECTRIC. Art of communicating between two distant stations by means of a code of prearranged signals conveyed by an electric current over a wire joining the two. Every telegraphic system comprises three parts, the generator of the electric current, the conductors or wires for conveying



Morse Electric Telegraph Instrument.

it, and the sending and receiving apparatus. The first to succeed in giving a practical character to the telegraph were Prof. Wheatstone, whose apparatus was known as the needle telegraph, and Morse, both 1837. This system, in a much simplified form, is now almost universally used. The transmitter is a key for making and breaking the electric circuit; the receiver is an electromagnet furnished with an armature, which is movable a short distance to and fro in front of the poles. Morse's code of signals, if recorded by the instrument as it was in the earlier



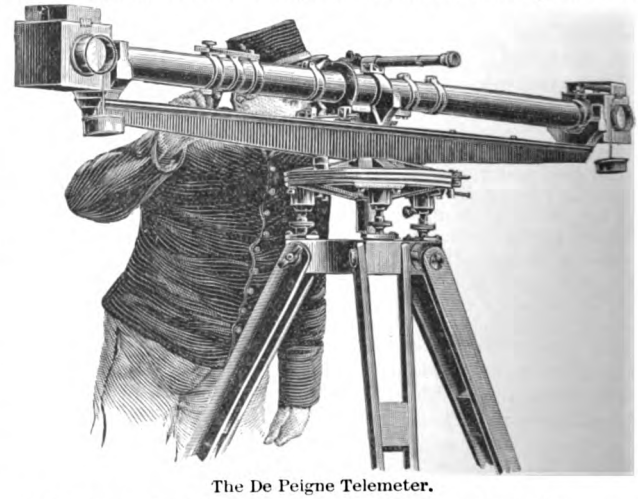
Hughes' Electric Telegraph.

forms, consists of a series of dots and dashes, a simple and different combination standing for each letter. At present the signals are interpreted almost entirely by the sound of the moving armature. Various forms of recording and printing telegraphs have been devised, as those of Hughes, Phelps, Edison, and Delany. The quadruplex system was invented by Edison 1877.

Telemachus. Son of Ulysses and Penelope; celebrated by Fénelon.

Telemachus, or **Alymachus,** ST. Monk killed at Rome 404 in attempt to check gladiatorial games. Public horror at the murder killed the practice.

Telemeter. Optical instrument for measuring distances. One form consists of a telescope in which a Rochon prism is placed between the object-glass and its principal focus: thus two images of a distant object are formed in the principal focus, whose interval is greater or less according to the distance of the prism from that point. When the instrument is used, the prism is moved till the two images appear in contact, and its distance from the focus is read off on a graduated scale. The divergence of the two rays is a constant of the prism, and



The De Peigne Telemeter.

may be determined by experiment. We have then the proportion that the visual angle of the object is to the deviation produced by the prism as the distance of the prism from the focus is to the focal length. With this instrument Arago determined the apparent diameters of the planets with great precision.—Also, an instrument for determining the distance by the velocity of sound. Le Boulenge's telemeter consists of a glass tube filled with liquid containing a metal disk of slightly greater specific gravity. When the tube is held vertical the disk falls with a nearly uniform motion. To use the telemeter for explosives, as with guns, the tube is held horizontal with the disk at zero mark. It is turned quickly to a vertical position at the instant the flash is seen, and when the report is heard it is turned back to a horizontal position. A scale on the tube gives the range directly, corresponding to the distance passed over by the disk.

Teleocephali. See PHYSOCLISTI.

Teleodactyla. See DIPLARTHRA.

Teleology. Study or doctrine of design or final causes; used in natural theology to prove the being and attributes of God.

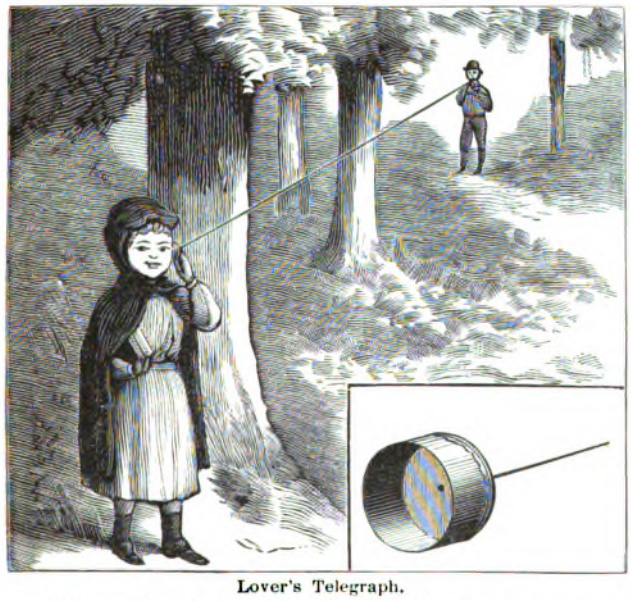
Teleosauria. See CROCODILIA.

Teleostei, or TELEOSTOIDEA. Fishes with a bony skeleton, though remains of the primitive cartilaginous cranium and notochord often persist. There are usually four pairs of free gill arches, and an external operculum. The skin is usually covered by cycloid or ctenoid overlapping scales. The heart has a bulbus arteriosus with two valves. Most Teleosts are oviparous, and the ova are fertilized after being spawned. The suborders are *Lophobranchii*, *Plectognathi*, *Physostomi*, *Anacanthini*, and *Acanthopteri*. They may also be considered in the two sections *Physostomi* and *Physoclisti*, and, using a more minute subdivision, as is general with American ichthyologists, we have these groups: superorder *Physostomi* (with open pneumatic duct), including orders *Apodes* (Eels), *Nematognathi* (Catfishes); and the following subdivisions of *Teleocephali*, *Glanencheli* (*Gymnonoti*, Electric eels), *Eventognathi* (*Plectospondyli*, Minnows), *Isospondyli* (Herrings, Shad, *Salmonidæ*), *Haplomi* (Pike, Pickerel). Also a few orders from the deep sea or foreign shores, not well-known, among them *Lyomeri* (Pelican fish). Superorder *Physoclisti* (with closed pneumatic duct) includes the following subdivisions of order *Teleocephali*: *Synentognathi* (Flying-fishes, *Exocœtidæ*), *Persesoces* (Mullets), *Percomorpha* (*Acanthopterygii*, the spiny-finned fishes, Perch, Bass, Bluefish, Mackerel, Dolphins, Swordfish, *Xiphiidæ*, Bonitos, Weakfish, Sheepshead, Toadfish, and many others), *Anacanthini* (Cod, Haddock), *Discocephali* (*Remora*), *Tæniosomi* (Ribbonfish), *Heterosomata* (Flounders); also the orders: *Hemibranchii* (Sticklebacks), *Lophobranchii* (Sea Horses), *Plectognathi* (Globefishes, Triggerfishes, Trunkfishes), *Pediculati* (Anglers), and order *Opisthomi*.

Teleostomi. Subclass of *Pisces*, including the GANOIDS and TELEOSTEI (q.v.).

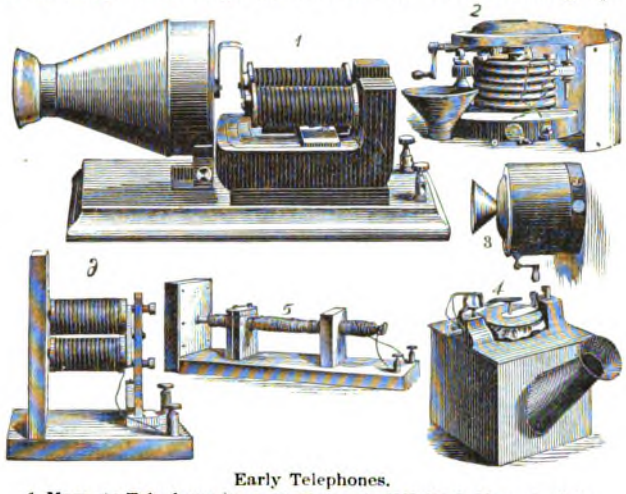
Telepathy. Thought-transference, or communication of an idea from one mind to another by some means other than the usual avenues of sense. Its possibility must still be regarded as doubtful, though surprising experiments under close restrictions have been apparently successfully carried out by reputable observers. Various theories have been advanced to account for the phenomenon, but until more exact and trustworthy information as to the facts is forthcoming, speculation is useless. The best experiments and theories are recorded in the Proceedings of the Society for Psychical Research.

Telephone. Apparatus for transmitting sounds to a distance; of two kinds, acoustic and electrical. In the former, sometimes known as the lover's telegraph, the sound-waves themselves are propagated along a stretched wire or string from one vibrating membrane to another. The magnetoelectric instrument, sometimes called the articulating telephone, invented by Prof. A. G. Bell, patented 1876, consists of a thin



Lover's Telegraph.

iron disk capable of vibrating in front of and very near to the pole of a strong steel magnet, around which is a coil of very fine insulated copper wire, connected to the line joining the two distant stations. The vibrations taken up by the elastic plate generate magneto-electric pulses in the coil, which are transmitted over the wire to a similar receiving instrument, where they are reconverted into sound-waves. The transmitting instruments usually employed depend for their action upon the principle of varying the resistance at the points of contact, first employed by Gray and by Edison (see MICROPHONE). The transmission of sounds by electricity seems to have been first effected by J. P. Reis of Friedrichsdorf 1860–61. Elisha Gray of Chicago constructed a "musical telegraph"



Early Telephones.

1, Magneto Telephone by A. G. Holcomb 1860–61; 2, Magneto Telephone by G. W. Beardslee prior to 1865; 3, Same inclosed for use; 4, Weyde Transmitter 1869; 5, Weyde Receiver ab.1869; 6, Weyde Receiver in 1870.

1866–67, and filed a caveat for transmitting a sound-wave through a wire Feb. 16, 1876. Graham Bell exhibited a different device for attaining the same result June 25, 1876. Edison's "loud-speaking" telephone was invented 1877. In 1897 there were 772,627 telephone instruments under lease in the U. S. See RECEIVER, TELEPHONE.

Telerpeton. Small lizard-like reptile from the Triassic sandstones of Elgin, Scotland. For many years this fossil was erroneously attributed to the Old Red Sandstone.

Telescope. Instrument for observing distant objects; of two classes, refracting or dioptric, and reflecting or catoptric. The simplest form is the astronomical instrument, which consists of two convex and preferably achromatic lenses at a distance apart nearly equal to the sum of their principal focal lengths. The lens directed toward the object is as large as convenient to secure as much light as possible, and of long focal length. It is called the OBJECT GLASS (q.v.), and forms an inverted real image of the object, just within the focus of the other lens, called the eyepiece. Thus the eye placed beyond the eyepiece sees a magnified virtual image of the real one. The terrestrial telescope differs from the above in having an arrangement for reinverting the image formed by the object-glass. This consists of a combination of two convex lenses, separated by a distance equal to the sum of their focal lengths, and so placed that the image to be inverted faces at the principal focus of the combination. Galileo, who was the first to examine the heavens, devised a simple form of instrument. The object-glass is a double convex lens; the eyepiece is a double concave lens, and so placed that the rays from the object-glass are incident upon it before they form an image. The result is a beam of divergent rays which the eye projects till they form an erect and virtual image of the object. By this means the length of the instrument is much lessened.

Lick Telescope. Aperture 36 in., focal length 57 ft. 10 in.

The common opera-glass is constructed on this principle. The chief forms of reflecting telescopes were those devised by Gregory, Newton, Herschel, and Cassegrain. In these the object-glass is replaced by a concave mirror, which forms the

real image to be viewed by the eyepiece; the instruments differ in the details of forming and examining this image. Astronomical telescopes are furnished with a smaller instrument, called finder, which has a much larger field, and has its axis parallel to that of the large one. Roughly, the magnifying power of a telescope is the ratio of the focal length of the objective to that of the eyepiece. Roger Bacon understood the principles on which the telescope depends ab.1250; so perhaps did Giambatista della Porta 1558; and Leonard Digges, by help of Bacon, before 1571; but the instrument was practically discovered in Holland 1608. The invention is claimed for Hans Lippershey, spectacle-maker of Middelburg; Descartes ascribes it to Metius (otherwise Andrianzoon) of Alkmaar. Another opinion is that Jansen, also of Middelburg, was the inventor in 1610. Galileo discovered satellites of Jupiter Jan. 1610; Kepler explained the telescope 1611. Newton invented the reflecting telescope 1668. An achromatic telescope was constructed by C. M. Hall 1723, and again by J. Dolland 1758.

Telesilla OF ARGOS. Heroine and lyric poet, who flourished ab.510 B.C. Her warlike deeds are probably mythical.

Telespectroscope. See SPECTRUM ANALYSIS.

Telesphorus. Bp. of Rome 128–139.

Teleutospores. Spores produced in the puccinia state of *Fungi* of the subclass *Uredineæ*. They are two-celled, and mark the third phase of the life-history of these parasites.

Telfair, EDWARD, 1735–1807. Delegate to Congress 1778 and 1780–83; Gov. of Ga. 1786 and 1790–93.

Telford, THOMAS, 1757–1834. English civil engineer; builder of many canals, of the Menai and Conway tubular bridges, and inventor of the Telford system of roadmaking; founder of Institution of Civil Engineers 1818. See MACADAM ROAD.

Tell, WILLIAM. Hero of Swiss legend. He shot an apple from the head of his son, at command of Gessler, whom he afterward slew. The story is connected with the Swiss revolt against Austria 1307–15.

Tell-el-Amarna. Village of central Egypt. Here were discovered, 1887–88, ab. 300 clay tablets containing correspondence in the cuneiform character from various courts of w. Asia; these have since been deciphered and published.

Tell-el-Kebir. Village of Egypt, e. of Cairo; site of Arabi's camp, taken by Sir G. Wolseley, Sept. 13, 1882, ending the rebellion.

Teller, HENRY MOORE, b.1830. U. S. Senator from Col. 1876–82 and since 1885; Sec. Interior 1882–85.

Teller, WILHELM ABRAHAM, 1734–1804. German rationalist, fined for his *Worterbuch des N. T.*, 1772.

Tellez, GABRIEL (TIRSO DE MOLINA), ab.1580–1648. Spanish dramatist and writer of tales; Prior of Soria 1645; author of some 300 comedies, interludes, and autos, of which 59 survive. His *Burlador de Sevilla* developed the legend of Don Juan.

Telluretted Hydrogen. H_2Te. Gas with a disagreeable odor, resembling that of sulphureted hydrogen; made by heating tellurium with zinc, and then treating this with hydrochloric acid. It precipitates many metals from their solutions in the form of tellurides. It burns with a blue flame, and is soluble in water.

Telluric Acid. $H_2TeO_4.+2H_2O$. Colorless crystals, made by converting the potassium salt into the barium salt and precipitating with sulphuric acid. It loses water on heating to 160° C., forming a white powder.

Telluric Anhydride. See TELLURIUM TRIOXIDE.

Telluric Lines. See SPECTRUM ANALYSIS.

Tellurite. TeO_2. Rare mineral compound of tellurium and oxygen, found with native tellurium.

Tellurites. Salts of tellurous acid.

Tellurium. Te. At. wt. 125?, sp. gr. 6.24, sp. ht. .047, mpt. 452° C., valence II. IV. VI.; discovered by Von Reichenstein, 1782; prepared from the ores by treating them with an oxidizing agent, isolating the tellurous acid thus formed, and then reducing with sulphurous acid; bluish-white substance of metallic luster; soluble in nitric and sulphuric acids; one of the rarer chemical elements, occasionally found in nature in a free state, but more abundantly in combination with gold, silver, and lead, as in the minerals nagyagite, sylvanite, and calaverite, the first being also known as foliated tellurium and graphic tellurium.

Tellurium Bromide. $TeBr_2$. Black substance, mpt. 280° C.; made by heating tellurium in bromine vapor. See the CHLORIDE.

Tellurium Chlorides. Two are known, $TeCl_2$ and $TeCl_4$. The former is a greenish-yellow powder, made by passing chlorine over melted tellurium. The latter is a white crystalline substance, made by treating the dichloride with chlorine. The corresponding bromine and iodine compounds are known.

Tellurium Dioxide. TeO_2. Tellurous anhydride; found as TELLURITE (q.v.); white crystalline solid, melting to a yellow liquid when heated; made by burning tellurium, or dissolving it in warm nitric acid.

Tellurium Fluoride. $TeFl_4$. Only compound of fluorine and tellurium; white mass, obtained by evaporating the solution of tellurium dioxide in hydrofluoric acid.

Tellurium Iodide. Similar to the chlorides and bromides.

Tellurium Tetrabromide. $TeBr_4$. Solid yellow substance, melting to a dark red liquid; sp. gr. 4.31; made by the direct union of the elements at ordinary temperature.

Tellurium Trioxide. TeO_3. Telluric anhydride; orange-yellow, crystalline substance, made by heating crystallized telluric acid.

Tellurous Acid. H_2TeO_3. White powder, made by mixing a solution of tellurium in nitric acid with water; slightly soluble in water; dibasic.

Tellurous Anhydride. See TELLURIUM DIOXIDE.

Telolecithal. Eggs in which the formative yelk is collected at one pole: hence the segmentation is discoidal. See EPIBOLE, GERMINAL DISK, and MESOBLAST.

Telotrocha. Annelid larva with a perianal and a præoral ring of cilia.

Telpherage. Transmission of vehicles hung from a wire to a distance by electricity, independently of any control exercised from the vehicle. Experimental telpher lines have been operated in various places, notably in Weston and Glynde, England.

Telson. Terminal joint, or median piece of the terminal joint, of higher *Crustacea*. In its base is situated the anal opening.

Telugu. Language of the Dravidian group.

Temesvar. Town of s. Hungary, 160 m. s.e. of Pesth; taken and sacked by Turks 1582; taken from them by Prince Eugene 1716; besieged by Hungarians April 1849; relieved by Haynau Aug. 10.

Temminck, CONRAD JACOB, 1778–1858. Dutch ornithologist; writer on Java.

Tempe. Narrow vale or ravine in n. Thessaly, between Mounts Olympus and Ossa, cleft through thick marble, through which flows the Peneus. It is ab. 6 m. long, and from 100 to

Vale of Tempe, Mount Olympus.

2,000 paces broad. The beauties of its scenery are much celebrated by ancient authors, and thus became a synonym for any beautiful valley.

Temper. That molecular property of steel by which it is made harder or softer for specific purposes. See TEMPERING OF STEEL.

Tempera. In Painting, same as DISTEMPER (q.v.).

Temperament. Distinguishing mental characteristics. Four classes are usually described: choleric, melancholic, sanguine, and phlegmatic. These classes correspond, in an imperfect way only, to certain well recognized types of disposition. Of late years a somewhat more promising attempt is being made on strictly psychological grounds to describe "types" in terms of mental method, but the whole subject is in an unsatisfactory state.

Temperance. Control of the appetites and desires by the moral sentiments and by reason. See ABSTINENCE.

Temperature. Maxwell defines the temperature of a body to be "its thermal state, considered with reference to its power of communicating heat to other bodies." It is then merely a condition of a body with which heat is temporarily associated, and can have no quantitative relations in any true

sense. The general principle of expansion by heat is employed in the devices for measuring or comparing temperatures. Two bodies are said to be in thermal equilibrium, and so to have the same temperature, if when brought into thermal communication neither loses heat to nor gains it from the other. Sensations of temperature are changes of consciousness aroused by the application of stimuli of heat or cold to the surface of the body. The end organs of the temperature sense are situated in minute points scattered over the skin in great numbers, and known as "temperature spots," some reacting to stimuli of cold and some to stimuli of heat, but not to both. The corpuscles and nerve endings which serve as recipients for temperature stimuli have not as yet been differentiated from those of TOUCH (q.v.) or pressure.

Temperature, CRITICAL. One in the cooling process of metals and alloys at which they have been found to have very much less tenacity than when hotter or colder. This is the temperature at which cracks occur in castings as they cool. For steel, experiments have seemed to show that this is ab. 600°, corresponding to a blue heat. For other metals such a temperature exists, but its limits have not yet been investigated. See CRITICAL TEMPERATURE.

Temperature Constant of Plants. Total quantity of heat or total excess of temperature above 40° required to bring a plant from budding up to the point of complete ripening of its fruit; sometimes known as Hoffman's or Linnsser's Constant.

Temperature of Reversal. See THERMOELECTRICITY.

Temperature of the Body. The normal temperature of the body averages 98.4° F. The human body can bear a high degree of heat diffused in the atmosphere, 400° F. and upward have been breathed for a short time, and cold 115° F. below freezing have been withstood. Excessive heat disposes the body to gastric and intestinal diseases, and particularly enlargement of the liver, which is of common occurrence in the torrid zone. Heat acts as an excitant, and cold as a sedative, inducing sleep, the tendency to which, after long exposure, becomes irresistible. See ANIMAL HEAT.

Temperature of the Earth. See EARTH.

Temperature of the Moon. Authorities have differed greatly. Langley, from his latest researches, concludes that it can never rise above the freezing point of water.

Tempering of Steel. Operation of giving to steel just the best relation between hardness and toughness to adapt it for use in cutting implements, etc. The action seems to be in hardening by sudden cooling to send the carbon into combination with the iron; in gradual cooling the carbon seems to separate out. The hotter the steel is when suddenly cooled, the more carbon unites with the metal, and the harder and more brittle the steel. In tempering, therefore, two methods are used. In one the metal is heated from a cold state to just the right temperature for the hardness desired, and is then quenched: in the other, the whole bar is heated to cherry-red, and the particular part to be tempered is quenched and hardened outright by immersing that part only. The heat is conducted to this hardened edge from the body of the bar, and softens or draws it until the desired point is reached, when the whole is quenched. The tempering process seems to depend on the rapidity with which the part passes from the limits of 930° to a temperature below that for forging, or to 400°. The temperatures are indicated on steel by the succession of tints which appear on a bright surface of the edge. These seem to be due to oxide forming. The following table gives these tints and temperatures, and the uses for which the steel is adapted when tempered by either process.

	F.	
Straw yellow, very pale . . .	430°	Steel engraving tools, hammer faces, planer tools.
" " darker	440°	Wood engraving tools, milling cutters.
" " "	470°	Wire-drawing dies, boring cutters.
Brown "	500°	Rock drills, taps, chasers. penknives.
Yellow with purple shade .	520°	Reamers, gouges, stone-cutting tools, twist drills.
Light purple	530°	Wood augers, drifts.
Dark "	550°	Cold chisels, axes.
" blue	570°	Framing chisels, planer knives.
Paler "	590°	Circular saws, screw drivers.
Paler " with green tinge .	630°	Springs, handsaws.

See STEEL, METALLURGY OF.

Temper Screw. Mechanical device attached to the upper end of the string of tools used in well-boring, by means of which the drill is lowered gradually, for three or four feet, as the hole deepens, without changing the point of attachment of the bore rod or cable.

Templars. See KNIGHTS TEMPLARS.

Temple. In London; originally headquarters of the Knights Templars, who occupied the New Temple in the Strand 1184. A

The Temple Church.

portion of it was first leased to students of the common law 1346. The Inner and Middle parts are now occupied by barristers, the Outer has been remodeled into the Exeter Buildings.

Temple, FREDERICK, D.D., b.1821. Author of the first and most memorable of the *Essays and Reviews*, 1860, on *The Education of the World*; head-master of Rugby 1858–69; Bp. of Exeter 1869, and of London 1885; Abp. of Canterbury 1896. *Religion and Science*, 1884.

Temple, H. J. See PALMERSTON.

Temple, SIR RICHARD, LL.D., D.C.L., b.1826. Anglo-Indian official 1846–80, knighted 1867; Gov. of Bengal and of Bombay; M.P. 1885; writer on India.

Temple, RICHARD GRENVILLE, EARL, 1711–1779. M.P. 1734; Lord Privy Seal 1757–61; adherent of Chatham till 1766. *Grenville Papers*, 4 vols., 1852–53.

Temple, SIR WILLIAM, 1628–1699. English diplomatist; Baronet 1666; Envoy to Holland 1668–70 and 1674; negotiator of several treaties. His *Miscellanea*, 1679–92, are notable for style: the paper on *Ancient and Modern Learning* led to a controversy. *Memoirs*, 1691–1709. Swift was his secretary and literary executor. *Works*, 1720, repub. 1814.

Temple, WILLIAM ERNEST, 1821–1889. Astronomer at Observatory Arcetre, Italy; discoverer of six asteroids and fifteen comets.

Temple, WILLIAM GRENVILLE, U.S.N., 1824–1894. Captain 1870, Commodore 1878, Rear-admiral 1884.

Temple Bar. Gate in London, between the Strand and Fleet Street, till 1878.

Temple Society. German Christians who separated from the church in Wurtemberg and settled in Palestine 1868. They await the second coming of Christ. They number ab. 5,000, of which 1,300 are in Palestine.

Temporal Bone. One of the bones of the skull forming that part of the head behind the brow and around the ear. The flat upper portion of the bone forms the temple, while the lower and more irregular part incloses the auditory apparatus. The name is given to this bone because the hair frequently first begins to turn gray in this region.

Temporal Power. Properly, the Pope's regal authority in the States of the Church, abolished 1871; also, more or less, the indirect civil authority resulting from his spiritual claims.

Temporary Stars. Stars which have appeared suddenly and after a time have again disappeared. Among recorded instances are those of Hipparchus 134 B.C., of Tycho Brahe 1572, Nova Cygni 1876, a star in the nebula of Andromeda 1885, and Nova Aurigæ 1892.

Tenacity. Maximum longitudinal stress which, when gradually applied, a rod or wire can sustain without rupture.

It is directly proportional to the breaking weight, and inversely proportional to the sectional area. It is also affected slightly by other considerations; *e.g.*, with the same cross section, a cylinder has greater tenacity than a prism. The most tenacious material is drawn cast-steel; a wire 1 millimeter in diameter can sustain a weight of 80 kilograms.

Tenaille. Rampart between two bastions raised in the main ditch in front of the curtain.

Tenant. Holder of lands by any title. If absolute owner he is tenant in fee; but he may hold for life, or for a fixed term of years, or from year to year, or at will or by sufferance. Again, he may be tenant in common, *i.e.*, he and others may hold several titles to a piece of land, but be united in possession; or joint tenant, when he and others own land by a joint title created expressly by one and the same deed or will; or in coparceny, when he and others take by descent as one heir. An ordinary tenant holds land from another, giving some consideration, either in money, produce, or personal service; or rents another's house.

Tenant Right. Supposed right to retain the use of land as long as the tenant continues to pay the customary rent or a slight advance thereon; and, on leaving the land, to dispose of its good-will to another tenant.

Tenasserim. S. part of Burmah, between Siam and Bay of Bengal; held by England since 1825. Area 46,590 sq. m.;

View at Tavoy, Tenasserim.

pop., 1891, 971,660. It is divided into seven districts. Tavoy, the chief town of the district of Tavoy, is 30 m. from the mouth of the Tavoy River.

Ten Brink. See BRINK.

Tencin, MME. CLAUDINE ALEXANDRINE GUÉRIN DE, 1681–1749. French social personage, mistress of the Regent and other eminent men, mother of D'Alembert; author of three romances, 1735–47. *Lettres*, 1790–1806.—Her brother, PIERRE, 1680–1758, was a Cardinal.

Tendai-Shin. Japanese Buddhist sect, founded from China ab.805, afterward in three branches.

Tender. Proffer of an act in accordance with the offerer's legal obligation.

Tendon. Tissue which binds a muscle to its place of attachment. It is white and fibrous; in many muscles cord-like in form. The contractile muscular tissue is attached to this inelastic substance, on which it pulls as one would pull on a rope, causing the desired movement through its attachment to the bone at the other end of the tendon.

Tendril. Slender leafless branch, or modified leaf developed into an organ adapted to aid a plant in climbing, as in the grape or pea.

Tenebræ Factæ Sunt. Responsorium following the fifth lesson on Good Friday in R.C. Ch.; descriptive of the last agonies of Christ. The service in which it occurs breathes the spirit of gloom, penitence, and mourning. The altar is shrouded in black, the bells are dumb, the candles on the altar are extinguished one by one, not to be relighted until Easter Eve.

Tenedos. Greek island in the Ægean Sea, off the Troad; ab. 8 m. by 3; held by Turkey, whose fleet was destroyed here by the Greeks Nov. 22, 1822. Pop. ab.15,000.

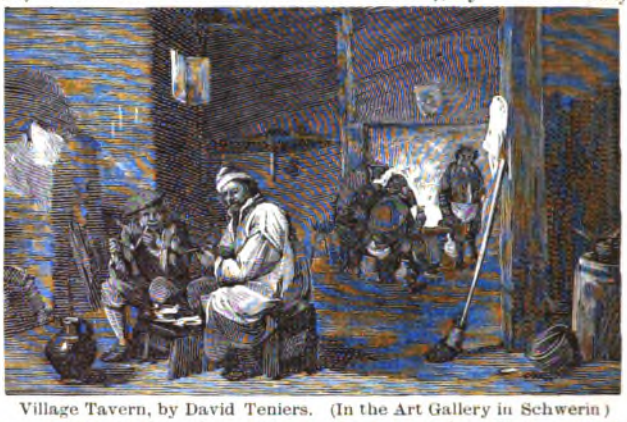
Tenement. Land, or anything of a permanent nature which may be holden.

Tenement Houses. Those which accommodate several tenants; in 1893 more than 70 per cent of the population of New York City were thus housed. At the present time these houses are, at the best, well provided with all modern conveniences, and, in proportion to the conveniences, are the most economical habitations, being provided with light and heat and other conveniences at the lowest price. Being under control of the Health Board, their sanitary condition is continually improving.

Tenerani, PIETRO, 1789–1869. Italian sculptor.

Teneriffe. Chief of the Canary Islands; area 780 sq. m., pop. ab.110,000. Its celebrated peak, Pico de Teide, is a volcano, dormant since 1798, 12,182 ft. high.

Teniers, DAVID, 1610–1690. Flemish genre painter of great reputation, his finest art being confined to scenes from peasant life, which lend themselves most thoroughly to his faculty



Village Tavern, by David Teniers. (In the Art Gallery in Schwerin.)

for rapid creation, for incisive, dexterous handling, and the cooler harmonies of color. He painted ab.700 pictures.—His father, DAVID, 1582–1649, was a painter of similar subjects.

Tenimber Islands. See TIMOR-LAUT.

Tenison, THOMAS, D.D., 1636–1715. Bp. of Lincoln 1691; Abp. of Canterbury 1694.

Ten Kate, JAN JACOB LODEWIJK, b.1819. Dutch poet; pastor at Amsterdam from 1860. *Creation*, 1866, tr. 1888.

Tennant, WILLIAM, 1784–1848. Scottish poet and Orientalist; prof. St. Andrews 1835. *Anster Fair*, 1812; *Syriac Grammar*, 1840.

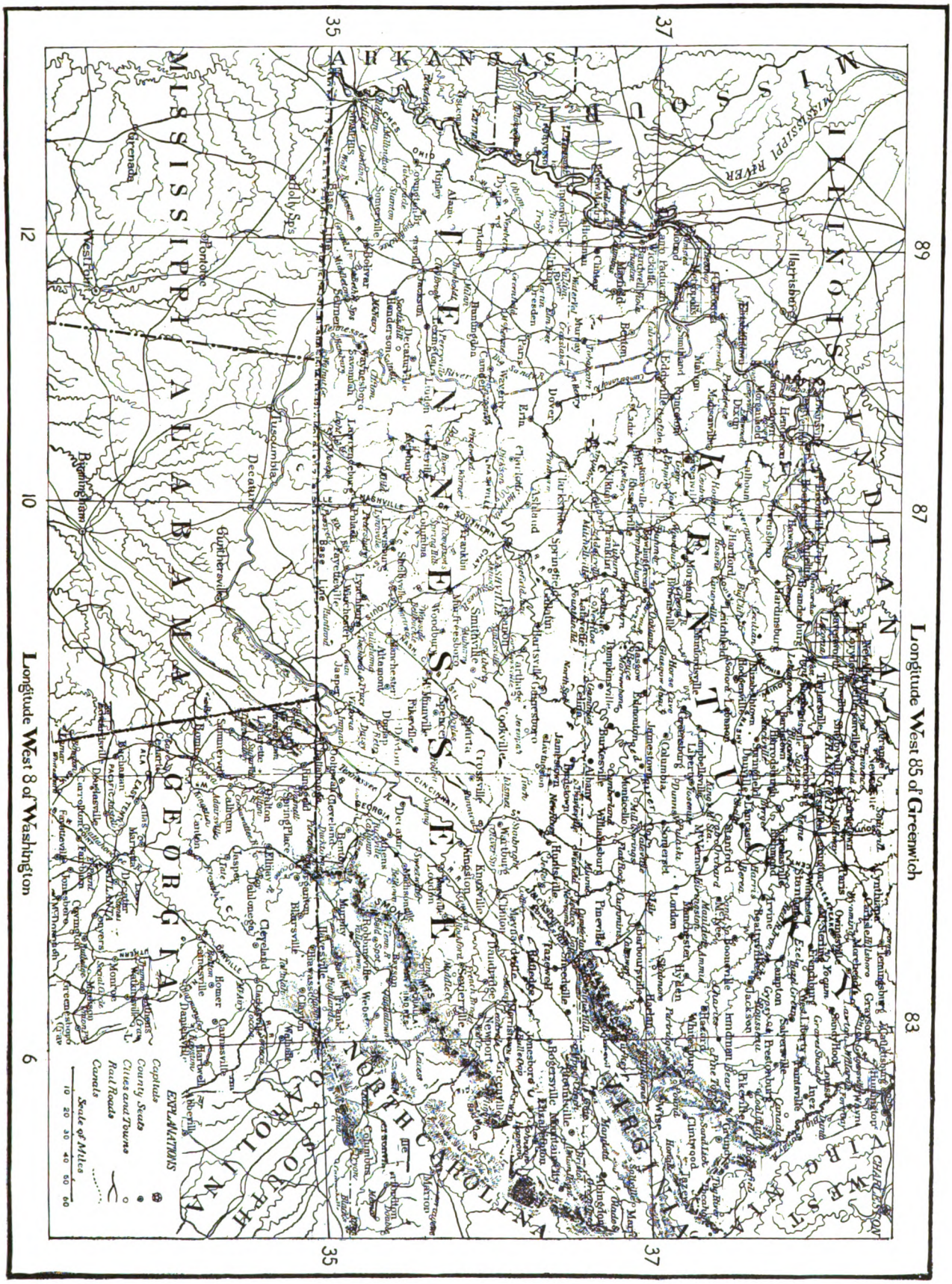
Tennantite. $Cu_8As_2S_7$. Mineral copper sulph-arsenite, usually containing some antimony and passing by gradations into tetrahedrite.

Tennemann, WILHELM GOTTLIEB, 1761–1819. Prof. Marburg 1804. *Hist. Philosophy*, 11 vols., 1798–1819; *Manual*, 1812, tr.1832.

Tennent, SIR JAMES EMERSON, 1804–1869. Irish M.P. 1832; in India 1841–50; Sec. Board of Trade 1852–67; Baronet 1867. *Greece*, 1826–30; *Belgium*, 1841; *Ceylon*, 1859.

Tennent, WILLIAM, 1673–1745. Irish immigrant ab.1717; founder in Bucks co., Pa., 1726, of the "Log College," the first Presbyterian school in America.—Of his four sons, all pastors, the most noted were GILBERT, 1703–1764, of New Brunswick, N. J., and Phila., and WILLIAM, 1705–1777, of Freehold, N. J., whose trance-experiences in youth were much discussed.

Tennessee. One of the s. central States; area 42,050 sq. m. Its e. boundary follows the crest of the Great Smoky Mts., and their w. spurs occupy its e. portion. To these succeed the valley of the T., intersected by long, narrow, parallel ridges, succeeded on the w. by the escarpment of the Cumberland plateau, which rises to a height of ab.3,000 ft. From its summit the plateau slopes gently to the n.w., and is deeply eroded by streams. The remainder of the State is of undulating surface without decided features. The w. slopes of the Smoky Mts. are composed of Devonian beds; the T. valley is floored by Silurian, with ridges of Carboniferous sandstone. The Cumberland plateau is of the Carboniferous formation, and this extends w. to the lower T., except an area of Silurian about Nashville. It is succeeded on the w. by Cretaceous and Tertiary. Immediately along the Mississippi are Quaternary deposits. The principal river, excepting the Mississippi, which flows along the w. border, is the T., which, heading in the mts. in the e. part, flows s.w. beyond the limits of the State, and in its w. part returns, crossing it to reach its mouth in w. Ky.; it is navigable from its mouth up to Muscle Shoals. The Cumberland also flows across the n. part. The mineral resources consist mainly of coal and iron. The industries are mainly agricultural, cotton, corn, and tobacco being the principal crops. Of its area more than 20,000,000 acres are in farms, and the value of farms, farming implements and machinery is ab. $250,000,000. The value of farm products in 1889 was ab. $55,194,181. Its manufacturing interests are mainly confined to a few leading cities, and are not as yet very extensive. The total length of railroads in operation in 1891 was 2,767 m. The capital is Nashville. The other principal cities are Memphis, Chattanooga and Knoxville. T. was originally part of N. C. The Watauga region, settled 1769, was the scene of sundry battles with Indians and British. The State of Franklin existed 1784–88. N. C. ceded the region to the U. S. 1790, and T. was admitted 1796 as the 16th State.


Longitude West 85 of Greenwich
Longitude West 8 of Washington
KENTUCKY
VIRGINIA
NORTH CAROLINA
ARKANSAS
MISSISSIPPI
ALABAMA
GEORGIA
MISSOURI
ILLINOIS
INDIANA
Mississippi River
Cincinnati
Nashville
Memphis
Knoxville
Chattanooga
Columbia
Jackson
Dyersburg
Clarksville
Murfreesboro
Bristol
Kingsport
Cleveland
Dyersburg
Tuscumbia
Decatur
Birmingham
Gadsden
Rome
Dalton
Cartersville
Atlanta
Gainesville
Dublin
Sparta
Milledgeville
Macon
Eatonton
Augusta
Aiken
Charleston
Columbia
Greenville
Spartanburg
Asheville
Hickory
Lynchburg
Roanoke
Bristol
Abingdon
Pulaski
Radford
Lexington
Staunton
Harrisonburg
Winchester
Frederick
Cumberland
Hagerstown
Chambersburg
Gettysburg
Harrisburg
Lancaster
Reading
Allentown
Easton
Scranton
Wilkesbarre
Williamsport
Pittsburgh
Wheeling
Parkersburg
Charleston
Huntington
Ashland
Paducah
Cairo
Hopkinsville
Bowling Green
Owensboro
Evansville
Vincennes
Terre Haute
Indianapolis
Cincinnati
Dayton
Springfield
Columbus
Zanesville
Marietta
Pittsburgh
Erie
Buffalo
Rochester
Syracuse
Utica
Albany
Troy
Schenectady
Binghamton
Elmira
Corning
Hornellsville
Olean
Jamestown
Buffalo
Niagara Falls
Lockport
Rochester
Geneva
Ithaca
Cortland
Oneida
Utica
Rome
Oswego
Watertown
Ogdensburg
Plattsburgh
Burlington
Montpelier
Concord
Portsmouth
Boston
Providence
Hartford
New Haven
New York
Trenton
Philadelphia
Wilmington
Baltimore
Annapolis
Washington
Richmond
Petersburg
Norfolk
Raleigh
Wilmington
Charleston
Savannah
Augusta
Macon
Atlanta
Chattanooga
Knoxville
Nashville
Memphis
Vicksburg
Natchez
Jackson
Meridian
Mobile
Montgomery
Selma
Tuscaloosa

At the outbreak of the Civil War it at first refused to secede, but joined the seceding States June 1861, furnished 50 regiments to the Confederate army, and was the scene of some of the most important battles during the war. Pop., 1890, 1,767,518, nearly one-fourth colored.

Tennessee, UNIVERSITY OF. At w. Knoxville; successor of Blount Coll., chartered 1794; this became 1807 E. Tenn. Coll., in 1840 E. Tenn. Univ., and in 1879 Univ. of Tenn. The State Experiment Station is connected with it. The academic department has a faculty of 22, with 334 students; the law school has 38 students under 3 instructors; the schools of medicine and dentistry, at Nashville, have 155 students and 28 instructors. Whole number of students 516; library 13,000 vols.

Tennessee River. Branch of the Ohio, rising in s.w. Va. and e. Tenn., in a valley between the high mts. of N. C. and the Cumberland plateau. It flows s.w., w., and n. Length ab. 1,200 m., drainage area 43,897 sq. m. It is navigable to Chattanooga, except for the rapids at Muscle Shoals.

Tenney, SAMUEL. 1748–1816. Surgeon in Revolutionary war; M.C. from N. H. 1800–7.—His wife, TABITHA (GILMAN), 1762–1837, m.1788, pub. *Female Quixotism*, 1807.

Tenney, SANBORN, 1827–1877. Prof. Vassar 1865, Williams 1868. *Geology*, 1859; *Zoology*, 1865–75.

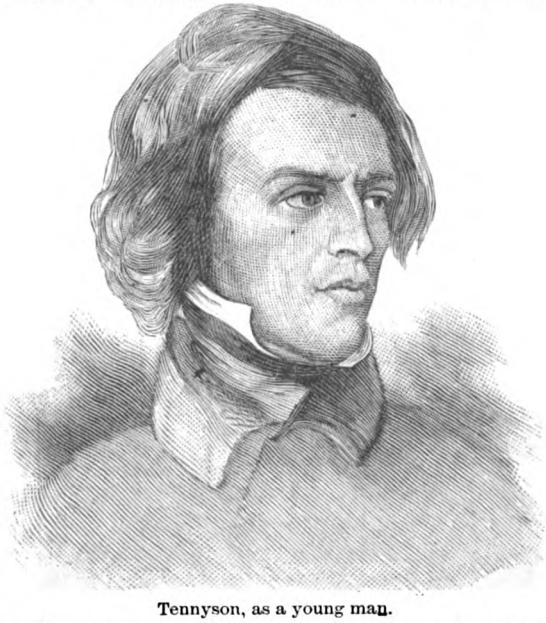
Tenney, WILLIAM JEWETT, 1814–1883. N. Y. journalist; ed. *Appleton's Annual Cyclopædia*, 1861–82. *Hist. Rebellion*, 1865.—His wife, SARAH (BROWNSON), 1839–1876, pub. *Life of Galitzin*, 1873.

Tenniel, JOHN, b.1820. Cartoonist in *Punch* since 1851; illustrator of *Alice in Wonderland*, *Ingoldsby Legends*, and other books.

Tennis. Oldest of all existing games of ball; was played in Europe in the Middle Ages, coming from Italy to France, and from France to England. The ball is thrown against a wall and struck by a racket on its rebound. It was formerly played in the open air, now generally in courts with walls, or with walls and roof. See COURT TENNIS and RACKETS.

Tennis, or LAWN TENNIS. Game played by two or four players. It consists in driving a small felt-covered ball across a net so that it may strike within a certain prescribed area. The players take turns in serving, *i.e.*, putting the ball in play; it must strike within a certain space of the opponent's court. After that, it may be struck on the fly, volleyed, or after the first rebound. A player failing to hit the ball, or hitting it and failing to place it over the net and within the confines of the opponent's court, loses the stroke.

Tennyson, ALFRED, D.C.L., LORD, 1809–1892. Poet laureate 1850, Baron 1884. His first volumes, 1830–32, won little attention; those of 1842 made him famous. *The Princess* followed, 1847, the greater *In Memoriam*, 1850, *Maud*, 1855. Four *Idylls of the King*, 1859, contained much of his noblest



Tennyson, as a young man.

work; others were added 1869 and later. *Enoch Arden*, 1864, won great popularity. His later works include three historical plays, *Queen Mary*, 1875, *Harold*, 1877, and *Becket*, 1884, besides *The Cup*, 1884, and *The Foresters*, 1892; but his genius shone more brilliantly in the lyric and the minor epic than in the dramatic form. He was a consummate artist, unsurpassed in melody, as in purity of thought and feeling. His character was of the highest; his tastes were secluded. He lived from 1853 at Farringford, Isle of Wight, and from 1870 in the summer at Aldworth.—His brother, FREDERICK, b.1807, has pub. 3 vols. of poetry, 1854–91. See also TURNER, CHARLES T.

Tenochtitlan. Chief city of the Aztecs, founded ab.1325 on an island in Lake Tezcuco; besieged, taken, and largely destroyed by Cortes 1521. The new capital built on its site long bore the old name, since changed to Mexico. Mexitl was the Aztec name.

Tenon. See MORTISE.

Tenor. Highest adult male voice; also applied to instruments of about the same compass.

Tenore, MICHELE, 1780–1861. Prof. of Botany in Naples. *Flora Napolitana*, 1811–38; *Géographie physique et botanique de Naples*, 1827.

Tenorite. CuO. Mineral compound of copper and oxygen, occurring in small scales with metallic luster; black oxide of copper.

Tenos. One of the Cyclades, s.e. of Andros. Area 70 sq. m., pop. ab.20,000.

Ten Persecutions. See PERSECUTIONS.

Tenpins. See BOWLS.

Tenrec. See TANREC.

Tensas. River joining the Washita, at Trinity, La., after flowing 250 m. through the State in a s.e. direction.

Tense. Modification of a verbal root to express time of action. Augment and reduplication seem to have been the earliest means for indicating a change from present to past. For this purpose the Germanic tongues largely employed Ablaut, *i.e.*, a change of the radical vowel, as in drink—drank.

Tensile Strength. Force required to tear apart a rope or bar when pulling in the direction of its length; usually measured in pounds per sq. in. of the cross-section. Values for strength are given in the accompanying table:

Brass, cast	ab.	18,000		
" sheets and wire	"	45,000		
Bronze (for guns)	"	31,000		
" (Tobin's, Cu,Sn,Tn.)	"	68,000		
" Phosper, cast	"	50,000	to	75,000
" " wire	"	100,000	"	150,000
Copper, cast	"	19,000		
" sheets	"	33,000		
Iron, cast, ordinary	"	17,000		
" " best	"	26,000		
" " for ordnance	"	35,000		
" wrought, bars	"	42,000	to	55,000
" " plate, best	"	50,000	"	60,000
" " eye-bars	"	32,000	"	50,000
" " large forgings	"	30,000	"	50,000
" " wire	"	86,000	"	100,000
Steel, low carbon	"	50,000		
" high "	"	110,000		
Tin, cast	"	35,000		
Zinc, cast	"	7,500		
" rolled	"	16,000		

The strongest metal tested is a special alloy of steel with tungsten, which gave in a compressed ingot an ultimate strength of 161,000 lbs. per sq. in.

Tension. State of stress produced by two forces acting in the same line but in opposite directions, as when two men pull on the ends of a rope. In practical applications it is important that the tension should not be so great as to produce a permanent stretch, or, in engineering language, the elastic limit of the material should not be exceeded.

Tension of Vapor. See VAPOR TENSION.

Tensor. In Quaternions, coefficient of a unit vector to give any definite length.

Tent. This is a very ancient habitation, being made of bark or leaves of trees, skins of animals and textile fabrics successively. They are often made waterproof by alum or hydrocarbons. The usual material is cotton duck, and the best form is conical.

Ten Tables. See TWELVE TABLES.

Tentacle. In Botany, sensitive glandular hair, by which some plants, *e.g.*, *Drosera*, capture insects.

Tentacles. Feelers. Among *Protozoa*, the Acinetans possess them. In the Jellyfish, Hydroids, and other cœlenterates they are usually flexible and long processes of the body wall, into which frequently the body cavity extends. They may be extended a great length and retracted almost like pseudopodia, except that their substance never becomes incorporated into the general body. Tentacles of this nature are common in the Worms, Holothurians, and Molluscoids.

Tentaculocyst. Modified tentacle of the scyphomedusan Jellyfish, containing a part of the gastro-vascular canal-system, otocysts, visual organs, and olfactory hairs.

Tenterden, CHARLES ABBOTT, LORD, 1762–1832. Judge of

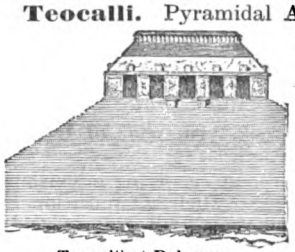
Common Pleas 1816; Chief-justice of King's Bench, and Knight, 1818; Baron 1827. *Merchant Ships and Seamen*, 1802.

Ten Thousand, RETREAT OF. See RETREAT.

Tenuirostres. Tribe of Passerine Birds, having long thin beak and feet ambulatorii or fissi; the hind toe is long. Here belong the beautiful clamatory Hoopoes (*Upupa*), the Oscinal Tree-creeper (*Certhia*), the Humming-birds (*Trochilidæ*), the Nuthatch (*Sitta*), and the Australian Lyre-bird.

Tenure. Legal form of holding land under English law.

Teocalli. Pyramidal Aztec temples, usually for human sacrifices. That of the City of Mexico, famous in the history of the Conquest, stood only 1486–1521: it was 375 ft. by 300, 80 ft. high, and terraced. The pyramid of Cholula, 1,440 ft. square and 177 high, is supposed to be of another and earlier class.


Teocalli at Palenque.

Teos. Ancient Greek city of Lydia, w. Asia Minor, 25 m. s.w. of Smyrna; birthplace of Anacreon.

Teosinte. *Euchlæana luxurians.* Forage plant of some value in the warmer portions of the U. S. In ordinary seasons it will not develop in the North.

Tephroite. Mn_2SiO_4. Mineral manganese silicate, similar to rhodonite, but of different percentage composition.

Teplitz. Town of n.w. Bohemia, noted for its hot springs, discovered 762; sanitary resort. The Triple Alliance against Napoleon was formed here Sept. 1813.

Teraphim. Small images idolatrously used in Hebrew houses from the time of the Judges to that of Ezekiel; repeatedly mentioned in O. T.

Terashima Munenori, 1832–1893. Japanese Minister to England 1872–73, and to the U. S. later; Count 1884.

Teratology. In Botany and Zoology, study o. monstrosities, or abnormal forms and structures, not resulting from postnatal disease.

Terbium. Tr. At. wt. 160° C., valence III. It was discovered by Delafontaine 1860. It occurs in LAMARSKITE (q.v.). Rare metal, forming colorless salts. Its oxide, Tr_2O_3, is a dark orange-yellow powder.

Terbium Nitrate. $Tr(NO_3)_3$. Deliquescent substance, made by treating the oxide with nitric acid. Heated to 500° C. it yields basic nitrates.

Terbium Sulphate. $Tr_2(SO_4)_3+8H_2O$. Colorless crystals, isomorphous with yttrium sulphate; made by treating the nitrate with sulphuric acid.

Terbium Trioxide. Tr_2O_3. Terbia; dark orange-colored powder: prepared from samarskite and cerite minerals; soluble in acids forming the corresponding salts.

Terburg, GERARD, 1617–1681. Dutch genre painter, who affected aristocratic types and subjects, and had a marvelously

Father's Warning, by Terburg.

fine finish; celebrated for his painting of satin dresses; confined to the small dimensions of panel befitting such execution.

Terceira. One of the Azores Islands. The surface is mountainous but the soil is fertile. The capital is Angra on the s. side. Exports are wine, oranges, and lumber. Area ab. 222 sq. m., pop. 45,000.

Terebenthene. See TURPENTINE.

Terebinth. *Pistacia terebinthus.* Turpentine tree growing about the Mediterranean, from 30–40 ft. high; source of Chian turpentine and noted for its longevity. Absalom was caught in its branches (II. Sam. xviii.).

Terebra. Ovipositor, when adapted for boring.

Terebrantia. Suborder of *Hymenoptera*, in which the female possesses a freely projecting or a retractile ovipositor, adapted for boring. There are three tribes, PHYTOPHAGA, GALLICOLA, and ENTOMOPHAGA (q.v.).

Terebratulina. See TESTICARDINES.

Teredo. See PHOLADIDÆ.

Teredo Navalis. See SHIPWORM and PHOLADIDÆ.

Terence (PUBLIUS TERENTIUS AFER), ab.185–159 B.C. Latin comic dramatist; b. at Carthage; brought to Rome a slave, and soon manumitted. Scipio, Lælius, and other nobles were his patrons. We possess six plays entire: *Andria; Hecyra*, or *Step-Mother; Heauton-Timoreumenos*, or *Self-Tormentor; The*

Scene from the Phormio of Terence.

Eunuch; Phormio; and *Adelphi*, or *Brothers.* These were all adaptations from the Greek of Menander, Apollodorus, and Diphilus. They have often been translated, and, from the modern tone which pervades them, are interesting to-day. The diction is good, the elaboration of the plots amusing and attractive.

Terentianus Maurus, 2d cent. African versifier. *De litteris, syllabis, metris*, pub. 1836.

Terentius Scaurus, QUINTUS, 2d cent. Commentator on Virgil and Horace; writer on grammar.

Terephthalic Acid. See PHTHALIC ACIDS.

Teresa, or THERESA, ST., 1515–1582. Spanish Carmelite nun, reformer of the order 1562; mystical writer; canonized 1622. Her day is Oct. 15. *Autobiography*, 1562; *Way of Perfection*, 1563; *Book of Foundations*, tr. 1853; *Interior Castle*, 1577, tr. 1852. *Works*, 1587.

Terete. In Botany, nearly cylindrical.

Tereus. See ITYS and PHILOMELA.

Terga. Posterior ventral plates of the barnacle's shell. In the position ordinarily assumed they are uppermost.

Tergum. Dorsal piece or notum of the arthropod segment.

Terhune, MRS. MARY VIRGINIA (HAWES: "MARION HARLAND"), b.ab.1832 in Va., m.1856. Author of many novels and several cook-books; founder of the *Home-maker*, 1888. *Alone*, 1853; *Hidden Path*, 1855; *Nemesis*, 1860; *Husks*, 1863; *His Great Self*, 1892. Her *Common Sense in the Household*, 1871, is widely used.

Term. Single algebraic quantity, unconnected with others by plus or minus sign. An aggregate of two or more terms bound together by a parenthesis may be an element in a complex term; *e.g.*, $3a(x+2y)^4$ is a single quantity in which the base is the sum of x and 2y, while 3a and 4 are respectively coefficient and exponent.

Term-Days. Days on which it is agreed that very frequent observations shall be made simultaneously at distant stations; first adopted 1825–30, when magnetic observations were made all over Europe.

Terminal. In Botany, belonging to the apex or end.

Terminal. Pillar, or pedestal, often in the form of a frustum of an inverted obelisk, to support a bust.

Terminal Inflorescence. Manner of flowering in which the flowers are produced at the ends of the stem and branches, instead of from the axils of leaves or bracts, as in lateral inflorescence.

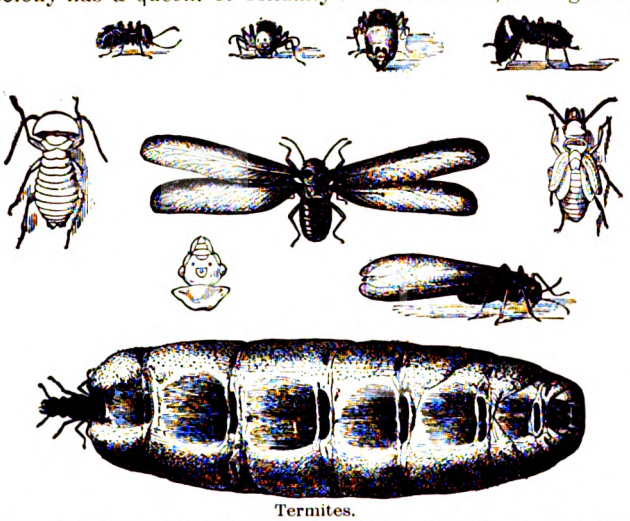
Terminator of the Moon. Ragged line which separates the illuminated from the unilluminated part of the moon's surface.

Termini. Port of n. Sicily, rebuilt as Thermæ 408 B.C., on the site of Himera, destroyed by Carthaginians. Pop. ab. 23,000.

Terminos, LAGUNA DE. Inlet on the Gulf of Mexico in the s.w. of the State of Campeche, Mexico. Resort for buccaneers at the beginning of the 18th century, now frequented for its woods. Length 70 m., breadth 40 m.

Terminus. Roman god of boundaries and frontiers.

Termites. White ants of the tribe *Corrodentia*, suborder *Pseudo-neuroptera*. They possess a pair of 18 to 20-jointed antennæ, a pair of ocelli as well as compound eyes, strong mandibles, and delicate wings, which lie parallel to the body when at rest. They live in communities, in passages hollowed out in wood, trees, mounds of earth, or nests of clay. Each colony has a queen, or sexually mature female, a king also,



Termites.

according to some authorities, and neuters of two sorts; viz., soldiers, with large heads and powerful jaws, and workers, with shorter head and broader abdomen. The workers are larvæ of both sexes. Only the mature sexual forms have wings, but these organs are lost by the queen after copulation. Africa and S. America are the principal habitats. See COMPLEMENTARY MALES AND FEMALES.

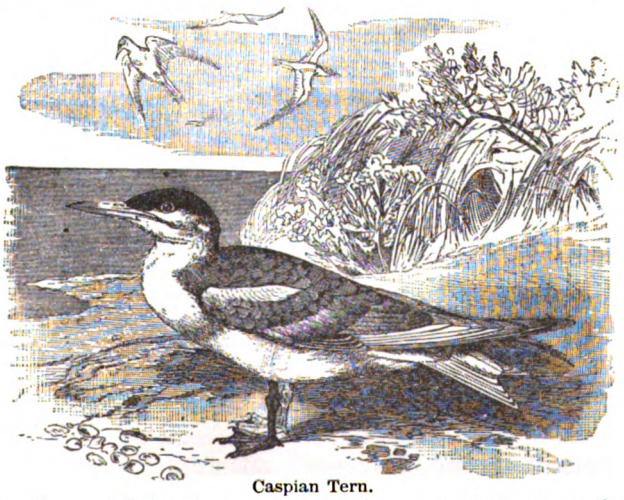
Ternant, JEAN BAPTISTE DE, 1750–1816. French soldier, in the American service 1778–82; Minister to the U. S. 1790–93.

Ternate. Arranged in threes, as the parts of a compound leaf.

Ternaux-Compans, HENRI, 1807–1854. French student, compiler, and writer on Spanish-American history. *Bibliotheque Americaine*, 1836; *Voyages*, etc., 20 vols., 1836–40; *Archives*, 1840–41.

Terne Plate. See LEAD, METALLURGY OF.

Terns. Sea-birds, that with Gulls form the family *Laridæ*. Compared with Gulls they are slenderer, have the nostrils near



Caspian Tern.

the base of bill, whose extremity is not hooked: the tail is usually more forked than in Gulls. They have a graceful swallow-like flight, and secure their fish-food by diving from a height, and even swimming beneath the water to complete the capture. Most belong to the genus *Sterna*, as the Caspian Tern, Wilson's Tern (Sea-Swallow), Arctic Tern, Roseate Tern, and Least Tern. Other terns are *Hydrochelydon nigra*, the American Black Tern, and *Gelochelidon nilotica*, the Marsh Tern. In length terns range from 9 to 20 inches; the bill is colored red, carmine or yellow, with usually more or less of the outer end black. The feet are black, vermilion, red, or orange. The plumage is pearly-gray, marked with white and black. Some are northern, others tropical.

Ternstrœmiaceæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Choripetalæ*, comprising 41 genera and ab. 300 species, almost all growing in the tropics; called the Camellia family.

Terpander, 7th cent. B.C. Greek lyric poet of Lesbos and Sparta; father of musical education.

Terpenes. 1. Volatile hydrocarbons, occurring in various plants; oil of turpentine is an example. Their composition is expressed by $C_{10}H_{16}$. They combine with hydrochloric acid, are optically active, polymerize with ease, and are closely related to cymene. 2. Compounds of this class prepared from conifers.

Terpsichore. Muse who presided over choral song and dancing.

Terrace. Area raised before a building above the level of the ground to serve as a walk; improperly used to denote a balcony or gallery.

Terracina. Town of central Italy, 60 m. s.e. of Rome. The Roman Tarracina was an important station on the Appian Way. Pop. ab. 6,500.

Terra Cotta. Variety of pottery, frequently used at an early period for architectural decoration. Statues were made of terra cotta in the time of Pausanias. It was also used to ornament the friezes of temples. In modern times it is again used in a variety of ways for ornamental and useful purposes. It is baked at a higher temperature than ordinary ware and withstands the weather.

Terra del Fuego. See TIERRA DEL FUEGO.

Terra Firma. 1. Land, as opposed to water. 2. Continents, as *vs.* islands. 3. Formerly, part of n.e. Italy subject to Venice, and n. part of S. America.

Terra Japonica. Gambier catechu, formerly supposed to be earth from Japan.

Terrapin. See EMYDIDÆ.

Terra Rosa. Red earth containing iron found in limestone regions. It is the undissolved residue of the calcareous rocks; often found in caverns.

Terre Haute. Capital of Vigo co., Ind., on the Wabash; settled 1816; site of the State normal school and the Rose Polytechnic Institute. Four railroads intersect here, and the Wabash and Erie Canal gives water communication with Lake Erie. Pop., 1890, 30,217.

Terrestrial. In Botany, neither aquatic nor arboreal in habit; growing upon land.

Terrestrial Magnetism. See MAGNETISM.

Terrestrial Paradise. Mediæval writers fix the location of the Terrestrial Paradise in e. Asia. Cosmas in the 7th century speaks of it as a continent e. of China; others regard it as an island s.e. of Asia, while by some it was fixed in China. Later we find it described as an island s. of India or in Armenia, and frequently as Ceylon. In the center was a fountain that watered it, near which grew the tree of life. These notions are largely drawn from the Book of Genesis, but similar conceptions are almost universal.

Terrestrial Radiation. Loss or radiation of heat by the earth into space, determined by Maurer to be 0.13 calorics per sq. centimeter per minute; heat radiated from the surface of land and water. It is partly absorbed by the atmosphere and partly transmitted directly through it into space; but that absorbed by the air is subsequently radiated by it, so that all terrestrial radiation eventually passes into space. Similarly, the heat communicated to the atmosphere by the sun directly or by convection from the earth's surface is eventually lost in space by atmosphere radiation. The sum total of radiation from land, ocean and air is terrestrial radiation in a general sense, and is just able to balance the solar radiation received.

Terricolæ. Oligochætous Annelids that live principally in the earth; *e.g.*, earthworm. See LUMBRICUS TERRESTRIS.

Terriers. Small to medium-sized dogs, of compact build, with slender but strong legs, erect ears, and tail curved up. They are good ratters and dig readily into the ground after prey. The English Terrier is smooth, and usually black and tan; the Scotch Terrier has a rough wiry coat of dirty white;

the Skye Terrier has long hair, long body, and short legs. The Turnspit has a long body and bandy legs. The Bull Ter-

Scotch Terriers.

rier, an extremely savage dog, is a cross between a terrier and a bulldog.

Terrill, WILLIAM RUFUS, U.S.A., 1834–1862. Brig.-gen. U. S. Vols. 1862; killed at Perryville.—His brother, JAMES BARBOUR, 1838–1864, became Brig.-gen. C.S.A. 1864.

Territellariæ. See TETRAPNEUMONES.

Territories of the U. S. New Mexico, Arizona, Oklahoma, Indian Territory, and Alaska, the last two unorganized.

Terror, REIGN OF. May 31, 1793–July 27, 1794; period in the French Revolution between the fall of the Girondists and the overthrow of Robespierre. Many eminent persons perished.

Terry, ALFRED HOWE, 1827–1890. Clerk Conn. Supreme Court 1854–60; Col. 7th Conn. 1861; Brig.-gen. U. S. Vols. 1862, serving in S. C. and Va.; captor (with Admiral Porter) of Fort Fisher, N. C., Jan. 15, 1865; Major-gen. U. S. Vols. and Brig.-gen. U.S.A. 1865; Major-gen. U.S.A. 1886.

Terry, ELI, 1772–1852. Clock-maker and inventor in Conn.

Terry, ELLEN, b.1848. English actress, on the stage from 1856; associated with Henry Irving from 1875; repeatedly in America; eminent in Shakespeare parts.

Terry, HENRY DWIGHT, 1812–1869. Brig.-gen. U. S. Vols. 1862–65, serving in Va.

Terry, MILTON SPENSER, D.D., b.1840. Prof. Garrett Inst., Evanston, Ill., 1884; O. T. commentator. *Hermeneutics*, 1883–90; *Sibylline Oracles*, 1890.

Tersteegen, GERHARD, 1697–1769. German hymnist and mystical preacher. *Spiritual Crumbs*, tr. 1837.

Tertian Fever. Form of intermittent or malarial fever where the chill and fever occurs every other day. It is so named because parts of three days are occupied by the cycle. It is a common form of the disease.

Tertiaries. Lay persons, attached to an order, especially the Franciscan, without taking vows or leaving the world; distinguished from monks proper, or Primaries, and nuns, or Secondaries.

Tertiaries. Quills (remiges) borne by the joint of birds' wings which is nearest the body.

Tertiary. Division of the Cænozoic Age, extending from the Chalk formation to the Glacial period; often called the era of Mammals. The Tertiary rocks are divided into the Eocene, Miocene and Pliocene, terms introduced by Lyell. See COLUMN.

Tertiary Alcohols. Derived from methyl alcohol, CH_3OH, by replacing the three hydrogen atoms with three similar or different hydrocarbon radicals. Upon oxidation they yield neither aldehydes nor ketones, but break down at once into an acid or acids containing a smaller number of carbon atoms. Example: Dimethylethylcarbinol, $C.CH_3.CH_3.C_2H_5.OH$.

Tertiary Compounds. Formed by replacing hydrogen in a CH group by a group or radical. Tertiary butyl alcohol is $(CH_3)_3COH$. See SECONDARY and PRIMARY COMPOUNDS.

Tertullianus, QUINTUS SEPTIMIUS FLORENS, ab.160–ab.235. Presbyter of N. Africa, originally a pagan jurist; from ab.200 a Montanist, but in general doctrine catholic; a fiery, stern, powerful writer, precursor of Latin ch. literature. His works exerted great influence, and are of historical importance.

Terwagne, ANNE JOSEPHE, 1762–1817. French revolutionist of bad character, prominent at the fall of the Bastile.

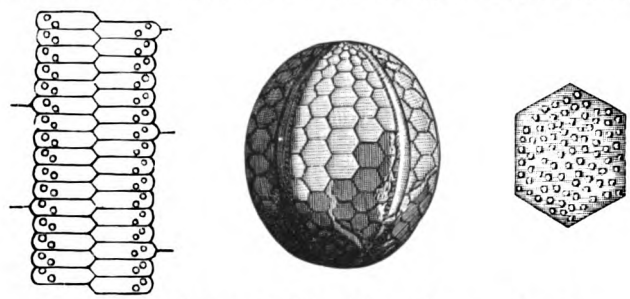
Teschemacher, JAMES ENGLEBERT, 1790–1853. Anglo-American chemist, mineralogist, and geologist. *Guano*, 1845.

Teschemacherite. Natural acid ammonium carbonate, occurring in connection with deposits of guano.

Teschen. Town of Austrian Silesia. Here a treaty was signed May 13, 1779, between Austria and Prussia, closing the war of Bavarian succession; Austria relinquished most of Bavaria. Pop. ab.13,000.

Tesla, NIKOLA, b.1857 in Croatia. Electrician in New York, associate and rival of Edison; T. C. Martin has described his *Inventions, Researches, and Writings*, 1894.

Tessellata. Palæozoic sea urchins, showing transitional forms to the Cystoids. Each interambulacral zone has five or six series of plates: and the ambulacral plates may be more than two rows. *Palæchinus* is an example. There are two



Palæchinus ellipticus.—The left-hand figure shows a portion of an ambulacral area enlarged; the right-hand figure exhibits a single interambulacral plate.

sections, the *Perischoëchinidæ* and *Bothrocidaridæ*. The former includes urchins having but one row of plates to each ambulacral zone; the latter includes forms with more than two vertical rows in each ambulacral or interambulacral zone. See CRINOIDS.

Tessellated. In Botany, having the surface divided into small geometric figures.

Tessellated Pavement. Roman pavement of pieces of brick or stone an inch square, forming geometrical patterns or animals and figures. See MOSAIC.

Tessceromedusæ (TESSERONLÆ, TETRAMERALIA). Group of Jellyfishes, including PEROMEDUSÆ, CUBOMEDUSÆ, and LUCERNARIDÆ (q.v.). They have their parts in fours.

Tessier, ULRIC JOSEPH, 1817–1892. Judge of Queen's Bench, Quebec, 1875.

Tessin. See TICINO.

Tessin, KARL GUSTAV, 1695–1770. Swedish official, orator, and author, tutor to Gustavus III.

Test (TESTA). Shell of Mollusks, Echinoderms, etc., or leathery tunic of Tunicates.

Testa. Outer seed-coat; ripened primine coat of the ovule of flowering plants; called also Spermoderm and Episperm.

Testacea. See ARCELLINA.

Test Acts. Passed in England 1661, 1672, and later, aiming to exclude Roman Catholics and Nonconformists from office and from membership in corporations; repealed 1829. Religious tests were enforced in the universities till 1871.

Testament. In English Law, originally, will bequeathing personal property. See WILL.

Testament, OLD AND NEW. Two great divisions of the BIBLE (q.v.), so called by a confusion, in the Greek, between Testament and Covenant.

Testamentary Guardian. GUARDIAN (q.v.) appointed by the father in his last will and testament.

Teste, LUCIEN AUGUSTE, 1765–1817. Swiss (German) writer on geology; prof. Vienna 1795, and Milan 1805; explorer in Brazil 1815.

Test Galvanometer. See GALVANOSCOPE.

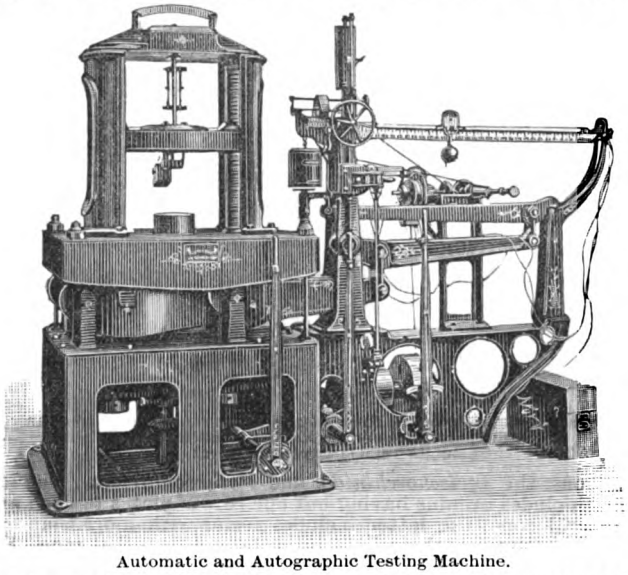
Testi, FULVIO, 1597–1646. Italian poet.

Testicardines (ARTICULATA, CLISTENTERATA, ARTHROPOMATA). *Brachiopoda* with a calcareous shell, with hinge and brachial skeleton. There is no anus. *Rhynchonella* and the allied *Spirifer* are ancient fossil forms. *Terebratulina* is still extant.

Testicle. See TESTIS.

Testimony. Oral evidence of witnesses.

Testing Machine. Apparatus by which known or measurable stresses can be applied to specimens of materials or members of structures, for ascertaining experimentally their resistance to such strains. The usual types of machine are to apply tests in tension, in compression, in flexure, or in torsion. One type can usually make the first three investigations; torsion requires a special but inexpensive machine for the best work. The older testing machines loaded a pan with direct weights and multiplied their effect by levers which applied the multiplied load to the specimen; recent ones use either the hydraulic press or screw gearing to produce the load upon the specimen, that load passing through the sample and being balanced by counterpoises upon a graduated scale beam. The counterweights on the scale beam can thus be regarded as applying the load through the multiplying levers as before, the



Automatic and Autographic Testing Machine.

strain gearing being used only to neutralize deformation as it occurs. There are therefore two types of testing machine with respect to the applying of strain, hydraulic and screw. The hydraulic machines have the advantages of working easily by hand and rapidly, and of easy release of load for determining elastic limit; they are not so well adapted to keep specimens under prolonged strain. The screw machines are adapted for use by power, with slow and gradual increase of strain and its prolonged maintenance. The torsional machines twist the prepared specimen by worm gear, and record the strain by the deflection of a loaded pendulum. The best machines give an autographic record of the test of specimens, a tracing point usually indicating elongations as abscissas upon the loads as ordinates. The largest machines are of the hydraulic type. The most perfect one ever built is the EMERY MACHINE (q.v.). The most powerful machine is that at Phœnixville, Pa.; its capacity is 2,160,000 lbs., and it can break a bar 45 ft. long.

Testis (TESTICLE). Essential reproductive gland of a male animal; in it, the spermatozoa are developed. In its most perfect condition of development a testis consists of a number of chambers or lobules, in each of which lie several coiled tubules (in Man, ab.800 each 2 ft. long). In the walls of the tubules the spermatozoa are formed by multiplication and transformation of epithelial cells. The tubules empty by means of a few straight tubes into a network of tubes from which in Man there are ab. a dozen vasa efferentia uniting to form the vas deferens or sperm duct. The latter in Man is ab. 20 ft. in length coiled up into an epididymis, and thence passing by a length of 2 ft. to reach the urethra. Testes are always paired and are developed and originate in the body cavity in a position corresponding to that of the ovaries, *i.e.*, near the kidneys. In most Mammals they slip backward through the inguinal canal into scrotal sacs of the skin at the external opening of the urino-genital sinus. In the elephant, most Edentates, and lower among Mammals and all other Vertebrates, they never leave their primitive position. In Rodents and *Insectivora* they descend through the inguinal canals only during rutting.

Test Oath. Generally, affirmation of present loyalty to a government. If so imposed as to be ex post facto in effect, it is unconstitutional in the U. S.

Testudinata. Broadly, all the CHELONIA (q.v.); in a restricted sense, the *Testudinidæ*.

Testudinidæ, or CHERSIDÆ. Land Tortoises, a family of *Chelonia*, having high arched carapace, under which the head and feet can be retracted. The feet have separate toes, and are adapted for walking. They are strictly herbivorous. The *Emydidæ* are, by some, included as a subfamily. Examples of the family are the large and strong Gopher-tortoises of the Carolinas, which burrow in the earth, the massive Amazon Tortoise, used for food by the natives, the Galapagos Tortoise, and the small Garden Tortoise of Europe, also used as food.

Tetanus. Disease characterized by the continuous spasmodic contraction of certain muscles. Frequently the muscles of the jaws; whence the common name, lock-jaw. The origin is now traced to the presence of a specific microbe: the bacillus of tetanus. It usually is associated with an infected punctured wound, as the puncture of a rusty nail. It is one of the diseases where serum therapy seems to be curative, the results of the injection of tetanus antitoxin being very satisfactory as far as there has been opportunity to use it. Prevention is far better than to risk the employment of the remedy, hence every punctured wound should be enlarged by a free incision to give an opportunity to properly cleanse the wound. If this is done promptly and thoroughly, tetanus will not ensue. Tetanus should not be confounded with tetany, which is also a disease of tonic spasm, but not so serious in its manifestation, nor is it due to an infection.

Tethya. See TETRACTINELLIDÆ.

Tethyoidea (ASCIDIANS). Mostly fixed *Tunicata*, with saccular bodies. The inhalent and exhalent pores are close together; the branchial sac is large. Development is through a tailed-larva stage. There are four orders: *Copelatæ*, *Ascidiæ simplices*, *Ascidiæ compositæ*, and *Ascidiæ salpæformes*. The first order may be grouped as *Perennichordata*, the others as *Caducichordata*. See ASCIDIANS.

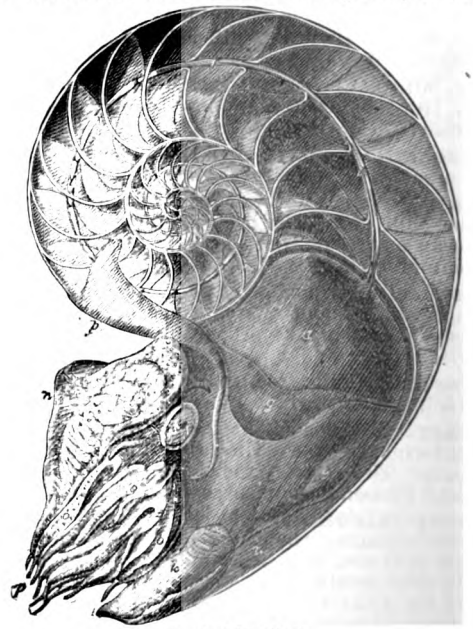
Tethys. Daughter of Uranus and Gæa; wife of Oceanus; mother of the ocean-nymphs and river-gods.

Tetraammonium Compounds. Formed by the union of a tri-substituted ammonia with the halogen compound of an organic group. They may be regarded as ammonium salts; thus trimethylamine, $(CH_3)_3N$, + methyl iodide, CH_3I, = tetramethylammonium iodide, $(CH_3)_4NI$.

Tetrabasic Acid. See ACID.

Tetraboric Acid. $H_2B_4O_7$. Pyroboric acid; brittle, glass-like substance, obtained by heating boric acid to 160° C. Its principal salt is borax, sodium tetraborate.

Tetrabranchiata. *Cephalopoda* with four gills, with a cleft funnel, and a many-chambered shell. The anterior chamber contains the animal; the others are united by a central siphuncle and contain air. *Nautilus* has 19 external tentacles (the dorsal pair can close the orifice of the shell), 2 ocular tentacles near each eye, and 12 internal tentacles, the four ventral of which, on left side, form the spadix; in the female



Pearly Nautilus:
a, The mantle; *b*, its dorsal fold; *e*, nidamental gland; *g*, shell muscle; *i i i*, siphon; *k*, funnel; *n*, hood; *o o o*, exterior digitations; *p*, tentacles; *s*, eye; *x x*, septa; *z*, last chamber.

there are 14 labial tentacles. The tentacles are perhaps homologous with the suckers of *Dibranchiata*. The Goniatites and Ammonites are fossil forms, and have the siphuncle external, the septa of the shell convex forward, and with edges

much folded. *Orthoceras*, of structure allied to *Nautilus* but with a straight (not spiral) shell, is also fossil.

Tetrabromfluorescein. See EOSIN.

Tetrachlornaphthalene. $C_{10}H_8Cl_4$. Naphthalene tetrachloride; mpt. 182° C.; solid, prepared by the action of chlorine or chlorate of potash and hydrochloric acid upon naphthalene; used in the manufacture of phthalic acid.

Tetrachord. System of four tones, which were the basis of the ancient Greek scales. It always compassed the interval of a fourth, but the middle tones were variable.

Tetracoralla. See RUGOSA.

Tetractinellidæ. Order of *Plethospongiæ*, including marine sponges with a more or less horny skeleton, inclosing a variable number of tetraxial spicules of flint: similar spicules are scattered freely throughout the sponge flesh. Other forms of spicules are present, but the prevailing form consists of a long ray bearing three short axes at one end. *Geodia* and *Tethya* are examples.

Tetrad. In Biology, group of four cells regularly placed in a square, resulting from a twice repeated binary division effected in vertically crossed planes.—In Botany, (1) four cells produced in the development of pollen grains from the mother-cells; (2) group of four chromosomes, formed in the primary egg-cell or pollen-cell preparatory to cell-division.

Tetradymite. Mineral compound of bismuth and tellurium, found in the gold regions of Va., N. C., and Ga.

Tetradynamia. Linnæan class of plants, comprising those having four longer and two shorter stamens, as in Cress, Mustard, Turnip, and Pepper-grass.

Tetragram. In Modern Geometry, complete quadrilateral; figure formed by four straight lines, no three of which are concurrent.

Tetragrammaton. Sacred quadriliteral name of God, J-h-v-h (Jehovah), which the Jews hold it unlawful to pronounce, substituting Adonai, Lord.

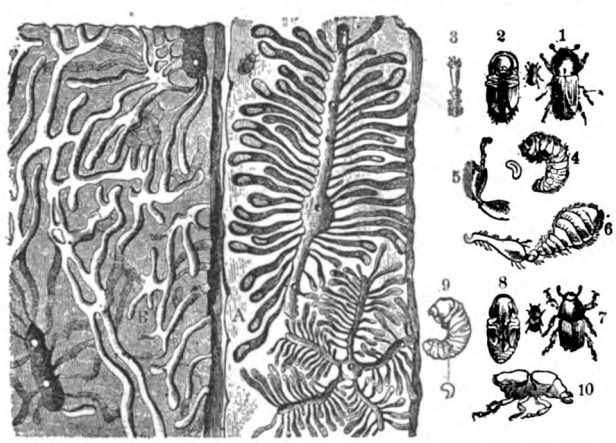
Tetragynia. Orders of plants having four pistils.

Tetrahedrite. $Cu_8Sb_2S_7$. Mineral copper sulphantimonite, in which the copper is often replaced in part by iron, silver, zinc, and mercury, and the antimony by arsenic; valuable as an ore of copper and, in the argentiferous varieties, of silver.

Tetrahedron. Polyhedron of four faces, necessarily triangles.

Tetralogy. Series of four plays or other writings.

Tetramera (PSEUDOTETRAMERA, or CRYPTOPENTAMERA). *Coleoptera*, with apparently four-jointed tarsus, but also an extra rudimentary joint. Here belong the *Bostrychidæ*, species of which injure pine trees by boring in the wood: the weevils (*Curculionidæ*), which have a proboscis, and whose larvæ live



1, *Bostrychus typographus*, Typographer beetle; 2, pupa; 3, foot; 4, larvæ; 5, leg; 6, feeler. 7, *Eccoptogaster scolytus*; 8, pupa; 9, larvæ. 10, *Eccoptogaster destructor*. A, borings of 1: B, borings of 7.

on fruit, grain, and plants in general (*Calandra granaria* is the Black Grain-worm); and the *Longicornia* or *Cerambycidæ*, with long antennæ. Some can produce a peculiar sound by rubbing the head against the thorax. The larvæ are elongated, have short antennæ and powerful jaws, and bore passages in wood.

Tetrameralia. See TESSEROMEDUSÆ.

Tetramerous. Flowers constructed on the quaternary plan, with four members in each circle of parts.

Tetrandria. Linnæan class of plants, comprising all those which have four stamens of equal length, as in many of the Madder family, the common Plantain, Dogwood, and Holly.

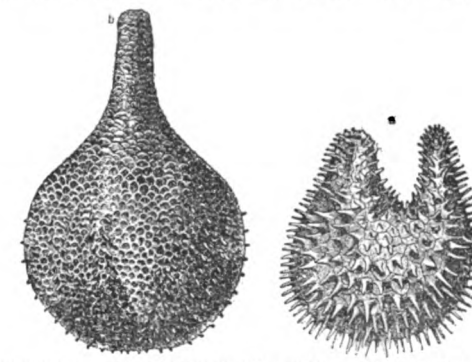
Tetraonidæ. Family of *Gallinacei*, having a stout body, with short neck, small feathered head, and short legs, usually feathered to the toes. Partridges and Grouse are examples. The latter are larger, with nostrils feathered, and usually a naked strip over the eye.

Tetrapetalous. Corolla consisting of four petals.

Tetraphyllous. Plant bearing four leaves, or calyx or corolla composed of four leaves (sepals or petals).

Tetrapleura. Zygopleural organisms with four antimeres, according to the promorphology of Haeckel. The Annelids are examples.

Tetrapneumona. Holothurians with flask-shaped bodies, at whose narrow end are both the mouth and anus. The in-



Tetrapneumona: a, *Ypsilothuria attenuata;* b, *Rhopalodina neurtali.*

testine has four gill-cæca. Ten tentacles are present, and five sets of double rows of ambulacral feet. *Rhopalodina* is an example. See APODA.

Tetrapneumones (TERRETELLARIÆ). See ARANEIDA and SPIDERS.

Tetrapolitan Confession. Prepared by Bucer and Capito in the Reformed interest; adopted by four cities, Strasburg, Constance, Lindau, and Memmingen; presented to the Diet of Augsburg July 11, 1530, but not read there, nor further accepted.

Tetraprionidian. Graptolites with four rows of hydrothecæ arranged down the stem of the polypary.

Tetraquetrous. In Botany, sharply four-angled; chiefly stems.

Tetrarch. Ruler of a fourth part; Galatian title, transferred by the Romans to Palestinian princes, as Herod Antipas, whom they were not willing to call king. The distinction was not much observed by their subjects. See Matt. xiv. 1, 9.

Tetrasepalous. Calyx composed of four sepals, as in St. John's Wort.

Tetraspores. Bright red spores formed by quadrate cell-division in many of the *Florideæ* or red *Algæ*. These are rarely in twos or eights, but ordinarily in fours; they propagate the plants independently of any sexual process.

Tetrastichous. Arranged on the stem in four longitudinal rows.

Tetrastigm. In Modern Geometry, complete quadrangle; figure formed by four points, no three of which are on the same straight line.

Tetrastoon. Courtyard with porticoes on its four sides.

Tetrastyle. Portico with four columns in front.

Tetrathionic Acid. See DITHIONIC ACID.

Tetrodon. See PLECTOGNATHI.

Tetter. Popular name given to several skin eruptions, more especially to various forms of ECZEMA and HERPES (q.v.).

Tetzel, JOHANN, ab.1455–1519. Dominican monk, whose abuse of Indulgences occasioned the breach of Luther with the Roman Church.

Teuffel, WILHELM SIGISMUND, 1820–1878. Prof. Tübingen from 1849; historian of Latin literature.

Teutones. German tribe, living probably near the Baltic. With the Cimbri, they invaded Gaul 113 B.C.

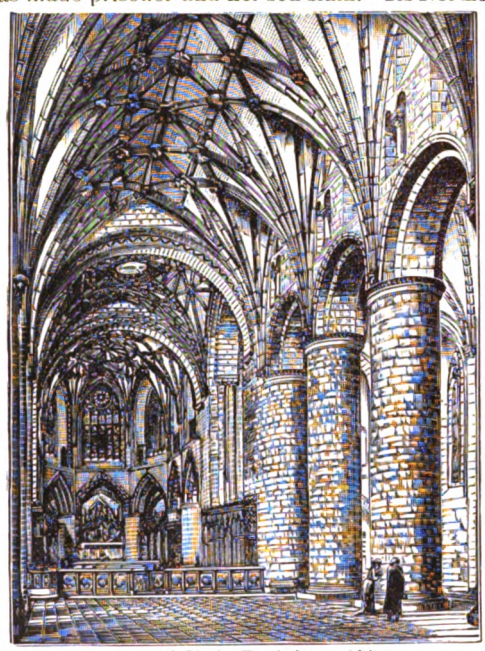
Teutonic. See GERMANIC.

Teutonic Knights. Military order founded 1190; its members took the three monastic vows. Herman von Salza 1210–39 transferred its sphere of operations from Palestine to heathen Prussia 1230, and founded an empire extending from the Oder to the Gulf of Finland. Its headquarters were removed from Venice to Marienburg 1309. It was the most im-

portant political power of n. Europe 1350–80. Internal decay and the rising power of Poland weakened it. It was defeated at Tannenberg (e. Prussia) July 15, 1410; gradually lost its territories; was suppressed by Napoleon 1809, and was reorganized 1840 and 1865.

Teutonic Mythology. The myths of the Germanic nations, which were transmitted from ancient times, and modified by association with other peoples. They had their gods and goddesses, which presided over the forces of nature, the elements, and the affairs of mankind, and the myths of the dead. See SCANDINAVIAN MYTHOLOGY.

Tewksbury. Town of Gloucestershire; scene of Edward IV.'s victory, May 4, 1471, over the Lancastrians. Queen Margaret was made prisoner and her son slain. Its Norman abbey



Portion of Choir, Tewksbury Abbey.

church, built 1123, measures 317 by 124 ft. across the transepts, with a massive tower 132 ft. high. It was restored by Scott in 1875–79, the later additions being in Early English, Perpendicular and Decorated styles. Pop., 1891, 5,269.

Tewfik Pasha, MOHAMMED, 1852–1892. Khedive of Egypt 1879; son of Ismail; succeeded by his son Abbas.

Texas. Largest of the States, on the Gulf of Mexico; area 265,780 sq. m. Stretching over 13 degrees of longitude and 10 of latitude, it contains all variations of surface and of climate. The e. part, along the Gulf coast, is low, marshy, and unhealthful. Further inland, it becomes higher and densely forested. Still further inland is a prairie region, more broken than the prairies of Illinois. This is succeeded by high arid tablelands, reaching their summit in the Llano Estacado, 3,500 to 5,000 ft. high; between, the Pecos and Rio Grande desert plains are intersected by short isolated ranges of mountains. Numerous rivers rise in the Llano Estacado and in the prairie region, and flow s.e. to the Gulf. Along the s.w. border, separating it from Mexico, flows the Rio Grande. Its principal branch is the Pecos, which joins it in the w. deserts. The geology of the State is as varied as its surface. The w. two-thirds are underlaid by Cretaceous formations, within which are found areas of Cambrian, Silurian, Carboniferous, and even Quaternary beds. Shoreward from this area of Cretaceous is a broad belt of Eocene, followed by Neocene, while along the Gulf, including all the low-lying country, are Quaternary beds. The industries differ widely in its different parts. In the e. the culture of cotton prevails; further w. that of the cereals as far as comparatively dense settlement has extended. Beyond that, on the w. and s., the ranging of cattle and sheep is the chief industry. In 1890 the value of farms was $399,971,289, of the agricultural product $111,699,430. In recent years the development of the railroad system of T. has gone on with extreme rapidity. In 1893 the mileage of railroads was 9,088. The State has not yet reached the stage of settlement where manufactures become of great importance. 585,000 tons of coal was mined in 1896. Its commerce is largely centered at the port of Galveston, and consists mainly of the shipments of cotton and cattle. Till 1821 the history of T. is that of a Spanish territory. After the purchase of La. by the U. S., Americans began to settle in T., and in 1821, when Mexico became independent of Spain, colonization from the U. S. was permitted and protected by the Mexican government; but in 1830 the American colonists were placed under military rule, and hence ensued the struggle for independence. The Mexicans were defeated 1836, and till 1845 T. was an independent State. In 1845 it was admitted, against the protest of Mexico, as one of the States. The result was a war, ending in Mexican defeat, the cession of Cal., New Mexico, and the intervening territory, now composing Nevada, Utah, and Arizona, and the payment of $15,000,000. T., on admission to the Union, sold to the U. S. the portion of its territory between the headwaters of the Rio Grande and Arkansas. The State seceded 1861, and was readmitted with a new constitution 1868. Capital, Austin. Pop., 1890, 2,235,523, over one-fourth colored.

Texas, UNIVERSITY OF. At Austin: opened 1883. It is coeducational, has 30 professors in the College of Arts, with 343 students. The Medical College, at Galveston, opened 1891, has 9 professors, 9 lecturers, and 248 students. The Law School has 144 students under 3 instructors. The Agricultural and Mechanical College, at Bryan, connected 1876, has 23 instructors and 354 students.

Texel. Island of n. Holland, in area ab. 35,000 acres; scene of naval battles 1653, 1673, and 1799. Pop. ab. 6,500.

Texier, CHARLES FÉLIX MARIE, 1802–1871. French explorer in Asia. *Asia Minor*, 4 vols., 1839 and later; *Armenia, Persia*, and *Mesopotamia*, 1842–45.

Textile Fabrics and Designing. See WEAVING.

Textularidea. Order of perforate *Foraminifera*, with small hyaline shells or large arenaceous ones, the chambers of which are usually arranged in a spiral or alternately.

Tezcatlipoca. God of the winter sun and of stern law; chief Aztec deity, with his brother Uitzilopochtli, god of the summer sun; worshiped with human sacrifices.

Tezcuco. City of Mexico, 17 m. e. of the capital; held from ab.1120 by a tribe often at war with the dominant race. Its remains are important. Pop. ab. 16,000. Its lake, between it and Mexico, covers ab. 80 sq. m., but is shallow.

Tezel. See TETZEL, J.

Thacher, GEORGE, 1754–1824. M.C. from Mass. (Me.) 1789–1801; Judge Supreme Court of Mass. and Me. from 1800.

Thacher, JAMES, 1754–1844. Surgeon in Continental army 1776–82, and at Plymouth, Mass. *Military Journal*, 1823; *Medical Biography*, 1828; *Hist. Plymouth*, 1832.

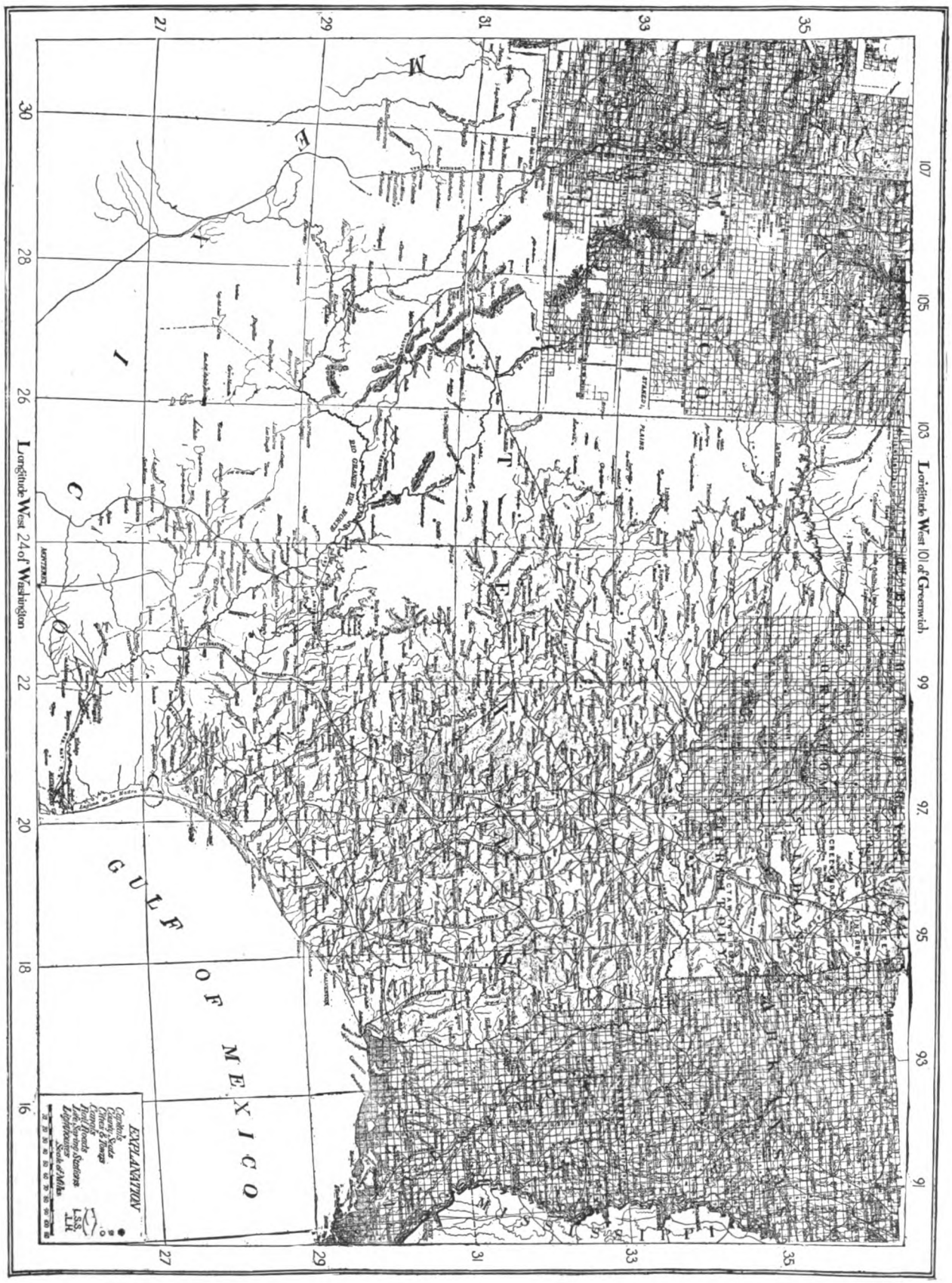
Thacher, THOMAS, 1620–1678. Pastor and physician in and near Boston; praised by Cotton Mather.—His son, PETER, 1651–1727, and great-grandson, PETER, D.D., 1752–1802, were noted preachers.—SAMUEL COOPER, 1785–1818, son of the last, was an early and able defender of Unitarianism.

Thackeray, ANNE ISABELLA. See RITCHIE.

Thackeray, WILLIAM MAKEPEACE, 1811–1863. English humorist and satirist, famous chiefly for the novels *Vanity Fair*, 1847–48; *Pendennis*, 1848–50; *Esmond*, 1852; and *The*

William Makepeace Thackeray.

Newcomes, 1853–55. These were followed by *The Virginians*, 1857–59; *Lovel*, 1860–61; *Adventures of Philip*, 1861–62; and the incomplete *Denis Duval*, 1867. Among his minor works are:


Longitude West 101 of Greenwich
Longitude West 24 of Washington
GULF OF MEXICO
EXPLANATION

The Paris Sketch-book, 1840; *Yellowplush Papers*, 1841; *Irish Sketch-book*. 1843; *Cornhill to Cairo*, 1846; *Book of Snobs*, 1848; *Titmarsh*, 1848; *Humorists of 18th Century*, 1852; *Four Georges*, 1857; and many ballads and lyrics. He was on the staff of *Punch* from 1842; illustrated several of his books; lectured in America 1855–56; founded the *Cornhill Mag.* 1859, and edited it till 1862. Though his keen satire was feared and resented, he was kindly, lovable. and eminently human, at heart "rather a sentimentalist than a cynic." For his daughter Anne, see RITCHIE, MRS. ANNE I.

Thaddæus, or LEBBÆUS. One of the twelve Apostles. See JUDE.

Thais. Athenian, mistress of Alexander and of Ptolemy, son of Lagus.

Thalamifloræ. Group of polypetalous Dicotyledons, having the stamens inserted on the receptacle.

Thalamophora. *Foraminifera* plus *Arcellina*.

Thalamus. See TORUS.

Thalassema. See CHÆTIFERA.

Thalassicolla. Genus of monozoic *Radiolaria*. It has no skeleton, but has a very complex nucleus. See PERIPYLÆA and THALASSICOLLIDA.

Thalassicollida. Family of peripylæan *Radiolaria*, including forms with a complex intra-capsular nucleus. The skeleton may be wanting or may consist of extra-capsular spicules.

Thalassophora. See BASOMMATOPHORA.

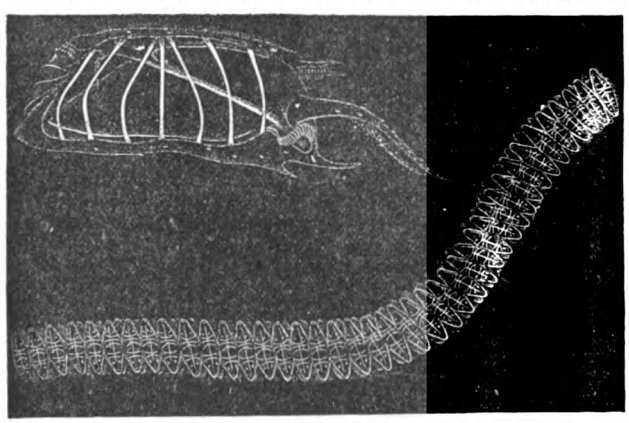
Thalberg, SIGISMOND, 1812–1871. Swiss-German pianist of high rank, well known in Europe and the U. S.; composer of many pieces for the piano, and of two unsuccessful operas.

Thaler. Silver coin of various German States, standard till 1871; nominal value ab. 72 cents.

Thales, ab.640–ab.548 B.C. Of Miletus; one of the Seven Sages; earlier of the Greek philosophers. He held that water or moisture was the principle out of which all things were developed, and is said to have brought to Greece from Egypt the earliest knowledge of mathematics.

Thalia. Muse of comedy.

Thaliacea (THALICEA, CONSERTA). Free-swimming, transparent, barrel-shaped Tunicates, with mantle orifices at opposite ends of the body. The branchiæ are band-shaped, and the animal moves by contractions of the branchial cavity. The



Salpa maxima, solitary; *S. democratica*, chain.

viscera are compressed into a small mass, the nucleus. They are solitary or are united in chains, in double rows usually. There are two orders, *Desmomyaria* (*Salpæ*) and *Cyclomyaria* (*Doliolidæ*).

Thallic Sulphate. $Tl_2(SO_4)_3+7H_2O$. Colorless tablets, made by dissolving thallium trioxide in dilute sulphuric acid and evaporating.

Thallium. Tl. At.wt. 204.18, sp. gr. 11.8, sp. ht. .032, mpt. 285° C., valence I. III.; discovered by Crookes in 1861; found in small quantities in a number of iron and copper pyrites and in a few micas; prepared by boiling the fine dust of sulphuric acid factories with sulphuric acid, and then precipitating with zinc; soft, bluish-white metal. It oxidizes when heated in the air, decomposes water at a red heat, and dissolves in dilute acids.

Thallium Carbonate. Tl_2CO_3. Long prismatic needles, obtained as a precipitate by treating the sulphate with barium carbonate.

Thallium Hydroxide. $TlOH+H_2O$. Long yellow needles, made by precipitating the sulphate with barium hydroxide.

Thallium Iodides. Similar to the chlorides and bromides.

Thallium Monobromide. TlBr. Yellow, crystalline precipitate, obtained by adding a solution of potassium bromide to a thallous salt; soluble with difficulty in water. It fuses at a red heat.

Thallium Monochloride. TlCl. White crystalline substance, turning violet when exposed to light; made by heating the metal in chlorine.

Thallium Monoxide. Tl_2O. Black powder, soluble in water; made by heating the hydroxide.

Thallium Nitrate. $TlNO_3$. Large, milk-white, rhombic columns, obtained by dissolving the carbonate in nitric acid.

Thallium Sulphide. Tl_2S. Black, lustrous, crystalline mass, obtained on fusing the precipitated sulphide.

Thallium Tribromide. $TlBr_3$. Yellow to brown crystalline, hygroscopic substance, soluble in alcohol; made by treating the monobromide, suspended in water, with bromine.

Thallium Trichloride. $TlCl_3+H_2O$. Colorless crystals, made by treating the monochloride with chlorine under water.

Thallium Trinitrate. $Tl(NO_3)_3.4H_2O$. Colorless, transparent, deliquescent crystals, made by dissolving the oxide in nitric acid.

Thallium Trioxide. Tl_2O_3. Reddish-brown powder, made by fusing thallium in an atmosphere of oxygen.

Thallium Trisulphide. Tl_2S_3. Black substance, obtained by heating the metal and sulphur together.

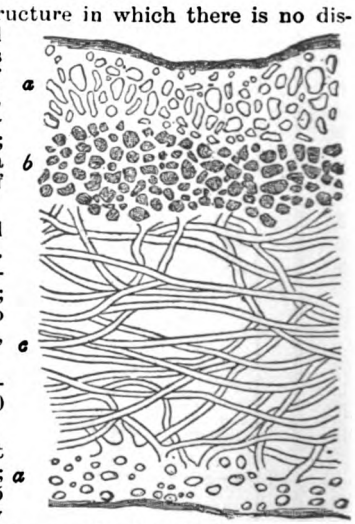
Thallogens. See THALLOPHYTA.

Thalloid. Having the characters of a thallus.

Thallophyta. Subkingdom of plants, having the vegetative organs in the form of a THALLUS (q.v.), including the *Algæ* or seaweeds, *Fungi*, and *Lichenes* or lichens; termed by some Thallogens.

Thallous Sulphate. Tl_2SO_4. Rhombic prisms, isomorphous with potassium sulphate; made by treating the hydroxide with sulphuric acid; soluble in water.

Thallus. Vegetative structure in which there is no distinction between stem and leaves. The typical thallus is a flat, broad structure of one or more layers of cells, as in the devil's-apron, sea-lettuce, and other sea-weeds; but it may be reduced to a filament of a single row of cells, as in many others.



Section of Stratified Thallus of *Ricasolia herbacea*: *a*, cortical stratum; *b*, gonidial stratum; *c*, medullary stratum.

Thames. Largest and most important river of Gt. Britain, rising in the Cotswold Hills and flowing e.; navigable for large vessels to London. Length ab. 250 m., drainage area 5,102 sq. m.

Thames. River of Ontario, Canada, flowing ab.160 m. s.w. to Lake St. Clair.

Thames Tunnel. At London; completed 1843; length 1,300 ft., width 35 ft., height 20 ft.; now used by a railway. Another tunnel was completed 1890 for the London and Southwark railway; it is 1½ miles long and consists of two tubes, 10 ft. in diameter, one over the other; the cost was $1,500,000. See SUBWAY.

Thamugas. See TIMGAD.

Thamyris. Legendary bard of Thrace, who challenged the Muses to a trial of skill, and, being overcome, was deprived of sight and the power of song.

Thane (THEGN). Anglo-Saxon noble, not by blood, but by service to the king; later, land-owner, knight, or baron.

Thanet, ISLE OF. At n.e. end of Kent. Area 26,180 acres; pop., 1891, 57,821. Ramsgate, Margate, and other resorts are on its shores.

Thanet, OCTAVE. See FRENCH, ALICE.

Thank-Offerings. See PEACE-OFFERINGS.

Thanksgiving Day. Usually the last Thursday of November; first observed as a harvest festival at Plymouth, Mass., 1621; long peculiar to New England; now universal in the U. S.

Thapsus. Town on the African coast, ab. 120 m. s. of Carthage; scene of Cæsar's victory over Scipio and Juba, 46 B.C.

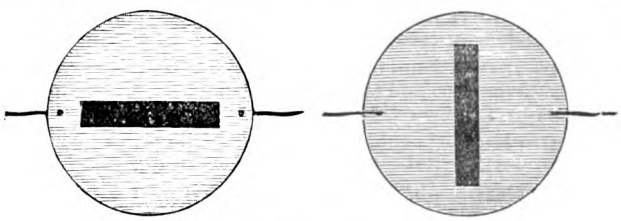
Thasos. Greek island in the Ægean Sea, off the coast of Thrace; anciently noted for its gold mines; held by Turkey. Area 85 sq. m., pop. ab. 5,000.

Thatcher, BENJAMIN BUSSEY, 1809–1840. American historical writer. *Indians*, 1832; *Tales of the Revolution*, 1846.

Thatcher, HENRY KNOX, U.S.N., 1806–1880. Commodore 1862; engaged on the Atlantic and Gulf coasts, and in both attacks on Fort Fisher; Rear-admiral 1866.

Thaumantidæ. CAMPANULARIÆ (q.v.); by some authors restricted to one of the families of this group.

Thaumatrope. Optical apparatus or toy, depending on the principle of the persistence of visual impressions. A piece of cardboard is painted on one side with a bird, for example,



Thaumatrope.

and on the other with a cage; when turned about its diameter as an axis very rapidly, the bird appears to be in the cage. See ZOETROPE.

Thaumaturgus. See GREGORY.

Thaxter, MRS. CELIA (LAIGHTON), 1836–1894. American poet. *Among the Isles of Shoals*, 1873; *Drift Weed*, 1879; *An Island Garden*, 1894.

Thayer, ABBOTT HENDERSON, b.1849. American painter. His *Mary Enthroned* was shown at the World's Columbian Exposition, Chicago.

Thayer, ALEXANDER WHEELOCK, 1817–1897. U. S. Consul at Trieste 1859–82. His *Life of Beethoven*, 3 vols., 1866–87, was pub. only in German.

Thayer, ELI, b.1819. M.C. from Mass. 1857–61; inventor; founder Emigrant Aid Co. 1854, to promote free-state settlement in Kansas.

Thayer, EUGENE, b.1838. Organist in Boston and New York; composer.

Thayer, JOHN MILTON, b.1820. Brig.-gen. U. S. Vols. 1862–65, serving in the West; U. S. Senator from Neb. 1867–71; Gov. of Wyoming 1875–78; Gov. of Neb. 1887–91.

Thayer, JOSEPH HENRY, D.D., b. 1828. Prof. Andover 1864–82, and Cambridge (Mass.) 1884; tr. Wiener and Buttmann's N. T. grammars, 1869–73, and Wilke's N. T. lexicon, 1886.

Thayer, SYLVANUS, U.S.A., LL.D., 1785–1872. Supt. and organizer of the Military Academy, West Point, 1817–33; pres. Board of Engineers 1838–63; fortifier of Boston Harbor; Col. 1863. *Engineering*, 1844.—His cousin, MARTIN RUSSELL, b.1819, was M.C. 1863–67, judge in Phila. from 1867, and a historical writer.

Thayer, THOMAS BALDWIN, D D., 1812–1886. Pastor at Lowell, Mass., 1833–45 and 1851–59, Brooklyn 1845–51, and Boston 1859–67; ed. *Universalist Quarterly* from 1862. *Theology of Universalism*, 1862.

Thayer, WILLIAM MAKEPEACE, b.1820 in Mass. Prolific author of biographies and tales for boys. His books are widely read, and some have been tr. into several languages.

Theaki. See ITHACA.

Theater. The early Greek plays were performed on temporary scaffoldings. The first theater of stone was completed at Athens ab.335 B.C. Plato says the play could be witnessed by 30,000 people. The tickets were small round tokens of lead, bone, or ivory, and cost two oboli (ab. 8 cts.). Dramatic representations were not given at Rome until 240 B.C., and then in the circus upon a wooden stage. Theaters of wood were erected from 145 B.C.; that of Scaurus, built 58 B.C., had 80-,000 seats. Pompey built the first stone theater 55 B.C., seating 40,000, but wooden theaters were still erected under the Empire. After 68 B.C. the first 14 rows of the ordinary seats were assigned to the knights; admission was by ticket, but free to all citizens. Awnings shielded the spectators from sun and rain. The first theater in London was erected 1576–77. The Blackfriars and the Globe, where Shakespeare's plays were produced, date from 1596 and 1598. The first theater in the U. S. was opened at Williamsburg, Va., 1752, the second in

Small Theater of Pompeii—Reconstructed according to Strack.

New York 1753. The state may regulate theaters under its police power.

Theatines. R.C. order, formed 1524 by Caraffa, Bp. of Theato (Pope Paul IV. 1555); confirmed 1540. They labored against the Reformation. Orders of nuns were founded 1583 and 1610.

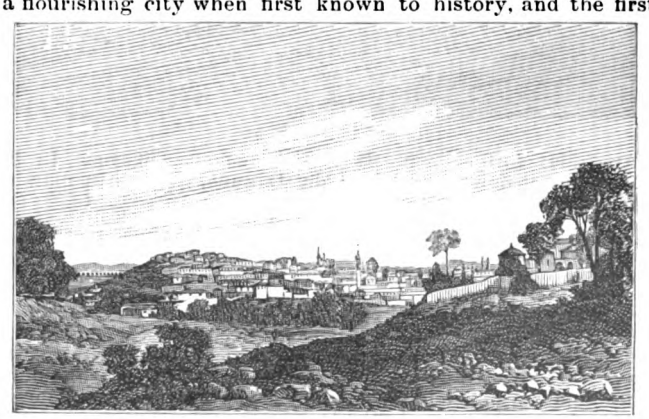
Théâtre Français, or COMÉDIE FRANÇAISE. Organized n Paris 1680, with Molière's troup and another; reorganized 1803. Its subvention, originally 12,000 francs, is now 240,000. In the selection and rendering of its plays, and in the ability and accomplishments of its actors, it maintains the highest artistic standards.

Thebaid. Upper Egypt, between lat. 24° and 27° 20′ N.

Thebaine. $C_{19}H_{21}NO_3$. Alkaloid, occurring in opium to the extent of ab. 1 per cent.

Thebaud, AUGUSTINE J., 1807–1885. French Jesuit, in the U. S. from 1838; pres. St. John's Coll., Fordham, N. Y., 1846–52; writer on Irish history.

Thebes. Ancient capital of Bœotia. Its acropolis was founded, according to tradition, by Cadmus, and its walls built by Amphion. It was the scene of Œdipus' adventures, a flourishing city when first known to history, and the first



Thebes.

power in Greece after the battle of Leuctra, 371 B.C., but lost its supremacy by the death of Epaminondas at Mantinea 362. It was destroyed by Alexander 336, rebuilt by Cassander 316, and taken in 290 by Demetrius Poliorcetes.

Thebes. Ancient city of Upper Egypt; called in Bible *No*, or *No Ammon;* 100-gated, according to Homer; on both banks of Nile; 140 stadia in circuit; capital of Egypt ab.1600 B.C. The ruins of Luxor and Karnak occupy part of the site. At Luxor are the two colossal statues of Memnon, one of which is said to have emitted a musical sound when touched by the morning sun.

Theca (THEKE). Spore-containing sac; sporanges of lichens and of mosses; sacs of the anther in flowering plants; calycle or coral cup of *Actinozoa*.

Thecaphora. See CALYPTOBLASTEA.

Thecaphore. Stipe supporting a single carpel or simple fruit; also pedicel of mosses.

Thecla, ST. Maiden of Iconium, converted by St. Paul; celebrated in the apocryphal *Acts of Paul and Thecla*, ab. 200.

Thecodontia. Order of extinct Lizards, with biconcave vertebræ, compressed teeth situated in alveolar cavities, and crowns covered with finely serrated striæ.

Thecomedusæ. Order of *Hydroida*, established by Allman to receive the *Stephanoscyphus mirabilis*, which consists of branched anastomosing chitinous tubes that ramify the substance of sponges, and open with expanded thecæ on the surface; out of these cups the medusoid polyp protrudes itself. Velum and sense organs are absent.

Thecosomata. *Pteropoda*, with a shell, an indistinct head, with rudimentary tentacles. The foot bears the epipodia (fins). The shell may be calcareous, horny, or cartilaginous. *Cymbulia* is an example.

Theed, WILLIAM, R.A., 1764–1817. English sculptor, as was also his son, WILLIAM, 1804–1891.

Theft. See LARCENY.

Thegn. See THANE.

Theine. See CAFFEINE.

Theiner, AUGUSTIN, 1804–1874. Keeper of the papal archives 1851–70; voluminous writer. *Clemens XIV.*, 1853; *Monumenta Poloniæ*, 1860–64; *Acta Concilii Tridentini*, 1874.—His brother, JOHANN ANTON, 1799–1860, of Breslau, was also a R. C. author.

Theism. Theory of the Divine existence, which opposes atheism in asserting the personality of the Absolute, pantheism in asserting the transcendency of God, and deism in asserting the supernatural and providential.

Theiss. Branch of the Danube, rising in the Carpathian Mts. and flowing 825 m. w. and s. through Hungary; mostly

Fishing on the Theiss.

navigable; full of fish. It is the ancient Tibiscus. In its lower half it flows parallel to the Danube, through a marshy plain, and with many windings.

Thellusson, PETER, d.1797. Swiss-English merchant, whose curious will led to the act of 1800 limiting the devising of property for accumulation to 21 years.

Thelwall, JOHN, 1764–1834. English author and radical politician.

Thelyblasts. Supposed female part of cells, separated (1) as mature ova after the polar globules are formed, and only the female pronucleus is left; (2) as the sperm blastophores, seminal granules, etc., in the testes.

Thelytoky. Sort of parthenogenesis which results usually in the production of females that are able to produce young without being impregnated, as in plant lice. See ARRENOTOKIA.

Themis. Daughter of Uranus, wife of Zeus, and mother of the Hours and the Fates; personification of order and equity.

Themistius, 4th cent. Orator and teacher at Constantinople; writer on Aristotle.

Themistocles, ab.515–449 B.C. Athenian statesman, of brilliant abilities but doubtful integrity. He procured the ostracism of Aristides 483; persuaded the Athenians to build a fleet, and commanded it on the invasion of Xerxes; induced Xerxes to fight the battle of Salamis, and so saved Greece; was accused of treason, ostracized 471, and spent his last years at the Persian court.

Thenard, LOUIS JACQUES, 1777–1857. Prof. of Chemistry in Paris, at Ecole Polytechnique 1837, and Coll. de France 1840. *Chimie Elementaire*, 1813–16.

Thenardite. Na_2SO_4. Natural sodium sulphate, one of the products of the evaporation of salt lakes; sometimes found in large quantity, as in Arizona.

Thenard's Salt. Blue mass, obtained by heating aluminium trioxide moistened with cobalt nitrate.

Theobald, LEWIS, ab.1688–1744. English dramatist and critic, attacked by Pope in the *Dunciad*. His edition of Shakespeare, 1733, is notable for its judicious emendations.

Theobromine. $C_7H_4N_4O_2$. Alkaloid, present in cacao butter; closely related to caffeine; colorless crystals, which sublime undecomposed; prepared from the butter.

Theocracy. Plan of a state in which God is regarded as the only sovereign, and the laws as His commands; *e.g.*, that of the Hebrews under Moses and the Judges.

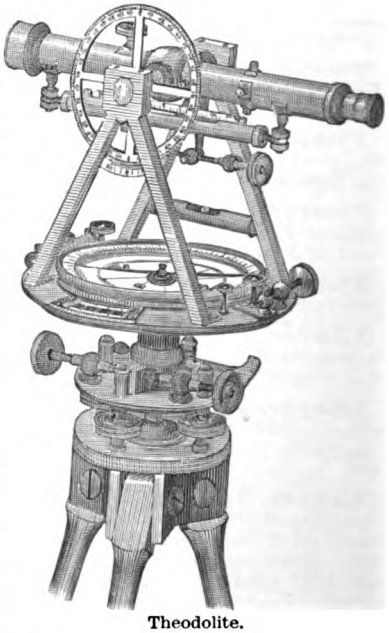
Theocritus, 3d cent. B.C. Greek idyllic poet of Syracuse; model for Virgil; first among ancient pastoral poets.

Theoctistus, ab. 900. Monk and hymnist of Constantinople.

Theodectes, 4th cent. B.C. Dramatist and orator at Athens.

Theodicy. In particular, the Leibnitzian theology; in general, any philosophic theology, as opposed to dogmatism.

Theodolite. Engineer's instrument for measuring angles and running lines; distinguished from the transit by the fact that the telescope cannot be reversed by turning it on its horizontal axis.



Theodolite.

Theodora, ab.508–548. Wife of Justinian 524, over whom she had great influence; of low birth; Empress from 527; noted for beauty, ability and courage; heroine of Sardou's play 1884. The reflections on her character in a work ascribed to Procopius, and pub. 1623, may be slanderous. She patronized the Monophysites.

Theodora, d. 855. Empress of Theophilus; Regent 842; protector of icons. She convened the Synod of Constantinople, broke with the Pope, persecuted the Paulicians, and endangered the Empire through wars with the Saracens.

Theodore (BARON DE NEUHOFF), 1686–1756. German adventurer, "King of Corsica" for brief periods 1736, 1738, and 1743; in London from 1749.

Theodore OF CONSTANTINOPLE, 6th cent. Historian of the period 450–565. Fragments remain.

Theodore OF MOPSUESTIA (IN CILICIA), ab.350–428. Presbyter at Antioch 383, Bp. in Cilicia 392; commentator. His writings were unjustly condemned 431 and 553. Some remain.

Theodore OF TARSUS, 602–690. Greek monk, sent to England as 7th Abp. of Canterbury 668. He did much for unity, ecclesiastical and civil.

Theodore, ST., OF THE STUDIUM, ab.759–826. Monk of Constantinople, thrice banished. Dr. Neale tr. several of his hymns.

Theodore I. Pope 642–649. He excommunicated two patriarchs of Constantinople as Monothelites.

Theodore II., 1818–1868. King of Abyssinia. He usurped the throne 1855, and while influenced by John Bell, an Englishman, ruled well. On Bell's death 1860, he became a tyrant,

and imprisoned the English missionaries and ambassadors. Lord Napier with 10.000 men stormed his capital, Magdala. April 13, 1868. T. killed himself the same day. A period of anarchy ensued, till Prince Kassai was crowned as Johannes II. 1872.

Theodoret, ab.392–457. Bp. of Cyrrhus in Syria 423; deposed as a Nestorian by the "robber Council" of Ephesus 449; restored by that of Chalcedon 451; called by C. Kingsley "wisest and holiest man in the East." His works include commentaries, a *Hist. Ch.* 325–429, tr. 1851, *Hist. Heresies,* and many letters.

Theodoric, 455–526. King of the Ostrogoths. He entered Italy 489, defeated Odoacer, and ruled ably, though at the last tyrannically, as in the execution of Boethius. See GOTHS.

Theodosius, d.376. 1. Spanish-Roman general, victorious in Britain 367, on the Danube 370, and in Africa 372; executed at Carthage. 2. His son, THEODOSIUS THE GREAT, ab. 346–395, became Emperor of the East 379, made peace with

Gold Medallion of Theodosius the Great.

the Goths 382, defeated and executed Maximus 388, suppressed paganism and Arianism, had 7,000 massacred at Thessalonica 390 in punishment of a riot, and submitted meekly to temporary excommunication by Ambrose. 3. His grandson, 401–450, was Emperor of the East from 408.

Theodulf, ab.753–821. Bp. of Orleans 801; deposed 819; poet. Some of his hymns are still in use.

Theognis, ab.570–ab.485 B.C. Greek gnomic and elegiac poet of Megara.

Theogony. Greek poem, ascribed to Hesiod, on the generation of the gods. Others, not extant, bore the names of Orpheus and Musæus.

Theologia Germanica. Pietistic German treatise of unknown origin, pub. 1516 and 1851; tr. 1854.

Theology. Doctrine of the divine nature and works; alleged science of religion. The term was used by Plato and Aristotle, but not in N. T. The serious and continuous effort to formulate and systematize Christian doctrine began ab. 300, lasted for some two centuries, chiefly in the East, and was revived with great zeal at the Protestant Reformation. This is properly Dogmatic Theology; other departments (so-called) are Biblical or Exegetic, Apologetic, Practical, and Historical. Natural Theology is preliminary, meaning the effort to prove the being and attributes of God from the light of Nature: the others deal with revelation and its results. The claim of theology to be a science is much disputed, and its influence and honors have greatly decreased of late; but for many centuries it was one of the most powerful factors in human life and history.

Theon, 4th cent. Greek mathematician of Alexandria; father of Hypatia. He edited Euclid's *Elements,* and put forth a commentary on the *Almagest.*

Theopaschites. Greek for PATRIPASSIANS (q.v.).

Theophanes, ab. 758–816. Abbot of Ager, n.w. Asia Minor; banished 813. His *Chronographia,* extending ab.300–800, was pub. 1839.

Theophanes, ab.1020. Bp. of Tauromenium in Sicily; author of 62 Greek homilies, pub. 1644.

Theophania. Daughter of Romanus of Constantinople; wife of Otho II. 972; Regent 983; introducer of some Greek customs into Germany.

Theophany. Appearance of God to O. T. patriarchs and saints, in brief visions; distinguished from the incarnation in Jesus.

Theophilanthropists. French deistical sect, formed 1796, abolished 1802. A similar body, probably small and short-lived, arose later in England.

Theophilus. 1. Christian of rank to whom St. Luke addresses his Gospel and its sequel, the Acts of the Apostles. 2. Bp. of Antioch 171–185; author of an apology, pub. 1861. 3. Mythical Bp. of Adana, s.e. Asia Minor; hero of a legend popular in the Middle Ages and similar to that of Faust. 4. Byzantine emperor 829–842; warlike, just, and powerful.

Theophrastus, ab.368–288 B.C. Philosopher of Lesbos and Athens, successor of Aristotle. His *History of Plants, The Causes of Plants,* and, still more, his *Characters,* have been repeatedly edited.

Theophylact, d.ab.630. Byzantine author of a history of the reign of Maurice Tiberius, 582-602, pub. 1604 and 1834, and of 85 letters, pub. 1499.

Theophylact, d.ab.1110. Metropolitan of Bulgaria 1078; eminent as a biblical theologian. His works, including commentaries based partly on Chrysostom, were pub. 1754–63.

Theopompus, ab.378–305 B.C. Greek historian and rhetorician, of Chios and Athens. Fragments only remain.

Theory. Systematic explanation of a phenomenon or phenomena, usually implying a degree of uncertainty about its truth, until verified.

Theory of Exchanges. Originally promulgated by Prévost of Geneva, who called it the theory of mobile equilibrium of temperature; developed by Prof. Balfour Stewart. It asserts that all bodies are constantly giving out radiations at a rate depending upon their substance and temperature, but independent of their surroundings; and that, when a body is kept at a uniform temperature, it receives back as much heat as it gives out. Accordingly two bodies at the same temperature and exposed to mutual radiation exchange equal amounts of heat; but if two bodies have unequal temperatures, that which is at the higher temperature gives to the other more than it receives.

Theosophy. Mystical hybrid of philosophy and theology, found among ancient Oriental races; cultivated especially by the NEOPLATONISTS (q.v.); revived in varying forms by Paracelsus, Cornelius Agrippa, and later by Behmen, Swedenborg, and others, as in 1875 by Mme. Blavatsky, who founded in the U. S. a Theosophical Society, now claiming a large membership in many lands. It resorted to internal revelation, as opposed to external authority, for its doctrine. In modern times it rejects both philosophic method and religious revelation, as traditionally accepted, and relies upon certain ill investigated and abnormal or exceptional facts to establish a kind of pantheistic idealism.

Theotokos. God-bearer; title conferred by the Third General Council (Ephesus, 431) on the mother of Christ.

Thera. See SANTORIN.

Theramenes, d. ab.403 B.C. Athenian orator and soldier; one of the 30 Tyrants, but opposed to their excesses, and condemned to the hemlock. His previous career was less creditable.

Therapeutæ. Ascetic sect of Egyptian Jews, described in a book doubtfully ascribed to Philo, *On Contemplative Life.*

Therapeutics. Branch of medicine which treats of modes of curing diseases.

Therapic Acid. $C_{17}H_{26}O_2$. Form of glyceride found in Cod-liver oil, which contains ab. 20 per cent.

Theremin, LUDWIG FRIEDRICH FRANZ, 1780–1846. Pastor 1810 and prof. 1839 in Berlin. *Abendstunden,* 1833–39; *Eloquence,* tr. 1850.

Theresiopel, or MARIA THERESIOPEL. German city of Maria Theresa; the Hungarian SZABADKA (q.v.).

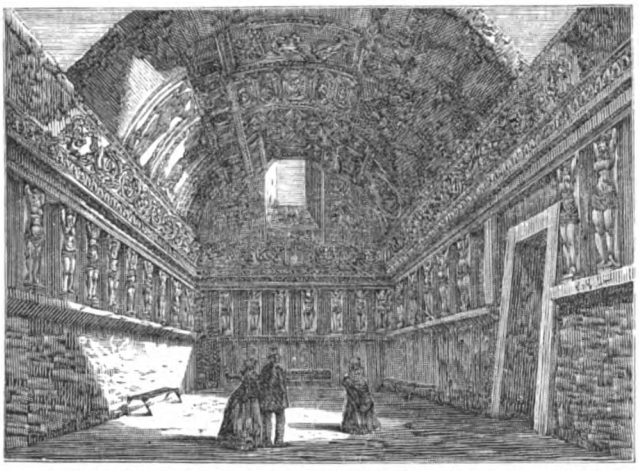
Thereza. CHRISTINA MARIA, 1822–1889. Empress of Brazil and wife of Pedro II. See PEDRO I.

Theriaca. Originally, as the derivation of the word indicates, an antidote to poisoning by beasts, more particularly to serpents' venom. As such, the various products known by this name were compounded with all the complexity of the pharmacopeia of the Middle Ages: the most noted of these mixtures was the Venice theriaca, containing ab. 70 ingredients mixed in honey. A preparation of opium flavored with spices and made in Persia also received this name, which survives in the Electuarium theriaca of the German pharmacopeia, corresponding to the Confectio opii of the British pharmacopeia. It is not now officinal in the U. S. Another meaning is attached to the word, as seen in the British pharmacopeia where theriaca is the officinal name for molasses; indeed treacle is a corruption of theriaca.

Theriodontia. Order of carnivorous, Triassic Reptiles, having affinities with carnivorous Mammals. Three kinds of teeth are present, large pointed canines, incisors and molars. There is also a supra-condyloid foramen on the humerus for the transmission of the brachial artery and median nerve as in

cats. *Cynodraco* is typical of the group, which is provisionally placed under the *Anomodontia*.

Thermæ. Public buildings of ancient Rome, inclosing, besides warm baths, colonnades for recreation and instruction.



Interior View of the Tepidarium in the Men's Baths of the smaller Thermæ, at Pompeii.

Those of Caracalla accommodated 1,600 bathers at once, those of Diocletian 3,200. The ruins of these remain. A theater was connected with the latter. See BATHS, ROMAN.

Thermal Constant. Number expressing, according to Linsser, 1860, and HOFFMANN (q.v.), the total amount of heat necessary for a plant in order to ripen its fruit. See PHÆNOLOGY.

Thermal Springs. See SPRINGS.

Thermal Unit. British thermal unit is the amount of heat necessary to raise 1 lb. of water from 39° F. to 40° F. The French and metric CALORIE (q.v.) is the heat required to raise 1 kilogram of water from 4° C. to 5° C.

Thermic Balance. See BOLOMETER.

Thermic Fever. See SUNSTROKE.

Thermics. See THERMODYNAMICS.

Thermic Wind-Rose. Diagram showing for any locality the average temperature during the prevalence of wind from each point of the compass.

Thermidor. Eleventh month of old French Republic, July 19–Aug. 18.

Thermobarometer. See HYPSOMETER.

Thermochemistry. Branch of chemistry dealing with the phenomena and laws of heat-changes taking place in chemical reactions.

Thermochrose. Property of some substances of transmitting certain radiation of long wave-length and of absorbing other kinds. It is now believed to be not merely analogous to color, but essentially identical with it.

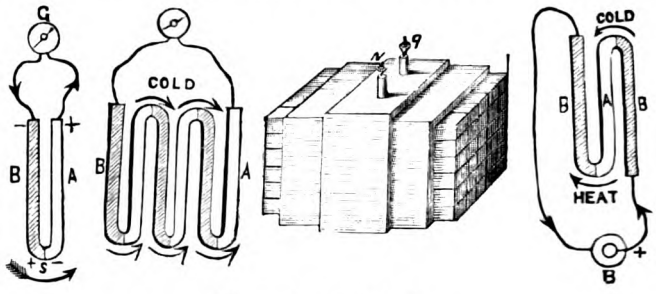
Thermodynamics. Department of the science of dynamics which treats of the phenomena of heat as due to motion. The foundation of the modern theory was laid 1824 by Carnot. In 1850–60 the theory of heat was developed independently by Rankine, Clausius, and Thomson; and by the more recent investigators, Maxwell, Zeuner, Hirn, and Boltzmann. Its first law has been thus enunciated: Heat and mechanical energy are mutually convertible; and heat requires for its production and produces by its disappearance mechanical energy in the proportion of 772 foot-pounds for each British unit of heat (see THERMAL UNIT). Heat is thus considered due to certain molecular motions in the molecules of bodies. The three assumptions of pressure, volume and temperature must be made in the case of any body to ascertain its condition as to heat. If a gas is compressed, its pressure and temperature increase, its volume diminishes; if its volume increase, pressure and temperature diminish, and besides the external work, certain interior work in the body has also to be done or accounted for. The usual assumptions of technical interest as to the variations of pressure with volume are represented graphically by one of the curves known as the ADIABATIC, ISOTHERMAL, ISODYNAMIC (q.v.), and the curves of constant pressure and of constant volume for a gas or vapor (see GAY-LUSSAC and MARIOTTE'S LAWS). The second law is that of the equivalence of transformations of heat and work, and may be thus stated: Equal work is performed during equal changes in the absolute temperature of a body (see ABSOLUTE TEMPERATURE); or, "If the absolute temperature of any uniformly hot substance be divided into equal parts, the effects of those parts in causing work are equal." *I.e.*, a variation in the living force or heat of a body doing work bears the same relation to the whole or initial heat, or living force, that the difference between the initial and final absolute temperatures (which is the variation of such absolute temperatures) bears to the whole or initial absolute temperature; *i.e.*,

$$Q_0-Q_1:Q_0::T_0-T_1:T_0 \text{ or } \frac{Q_0-Q_1}{Q_0}=\frac{T_0-T_1}{T_0}$$

The formulæ of thermodynamics enable many problems of the conversion of heat into work to be solved, as also many relating to the flow and action of gases pure and mixed. The fundamental principles were brought out simultaneously by Rankine and Clausius 1850.

Thermoelectric Couple. See THERMOELECTRICITY.

Thermoelectricity. Seebeck of Berlin in 1821 discovered that the law of Volta, according to which there can be no resultant electromotive force in a circuit composed solely of different metals, is subject to exception when the junctions are not all at the same temperature. In this case a thermoelectric current flows through the circuit. If, *e.g.*, pieces of iron wire and copper wire be joined at the ends forming a circuit and one of the junctions be heated, a thermoelectric couple is formed, and a current flows from copper to iron through the hot junction. The electromotive force developed within the closed circuit is approximately proportional to the difference of temperature of the two junctions if this difference be very small; if measured in microvolts, it is equal to the difference of temperature multiplied by a number dependent on the nature of the metals in the circuit. This number is called the thermoelectric power of the two metals at the given mean



Thermoelectric Batteries.

temperature, and varies with the temperature. The thermoelectric power of iron and copper decreases as the temperature rises till a mean temperature of 274.5° C. is reached, when it is zero, while above this the current is reversed in direction. If the colder junction be at a fixed temperature below the NEUTRAL POINT (q.v.), and the other junction be heated, the electromotive force will increase till the higher temperature reaches the neutral point; then it will decrease, and become zero when the higher temperature is as much above the neutral point as the lower one is below it. The temperature of the hot junction is in this case called the temperature of reversal. A thermoelectric series was arranged by Seebeck so that the thermoelectric power of any two metals was the greater the further apart these metals were in the series. Antimony and bismuth are the extremes of this series. See THERMOELECTRIC POWER. Thermobatteries, called THERMOPILES (q.v.), have been constructed on this principle.

Thermoelectric Power. Potential-difference in a circuit of two metals at the mean temperature t°, when one junction is kept half a degree above t° and the other half a degree below it. The following table gives approximately the thermoelectric powers for certain metals, the mean temperature being 20°. The potential-differences are given in microvolts per degree, and are referred to that of lead taken as zero (Jenkin):

Bismuth	+97.0	Platinum	—0.9
Cobalt	+22.0	Copper (pure)	—3.8
German silver	+11.75	Antimony	—6.0
Mercury	+0.418	Iron	—17.5
Lead	0.	Tellurium	—502.0

See THERMOELECTRICITY.

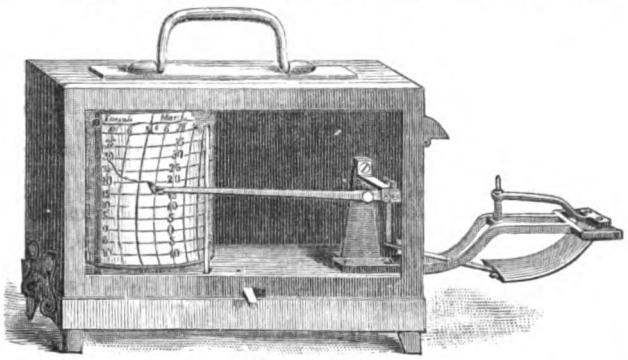
Thermograph. See THERMOMETRY.

Thermoisopleths. Special form of ISOPLETHS (q.v.) in which the curves present temperatures, while the co-ordinate axes present times or places, or times and places. This term was first used by Erk of Munich, as applied to his diagram, where the co-ordinate axes are time of day and of year. S. A. Hill has given thermoisopleths for time of day and altitude above the ground.

Thermolysis. See DISSOCIATION.

Thermometer. Instrument for measuring temperature; *i.e.*, determining the condition of a body with respect to its sensible heat. Invented by Galileo before 1597. The alcohol thermometer also was invented by him ab.1612. Fahrenheit made a mercury thermometer 1721; his division of the scale dates from 1724. Linnæus introduced the present arrangement of the Centigrade scale. The minimum thermometer was produced by Casella 1861. See THERMOMETRY.

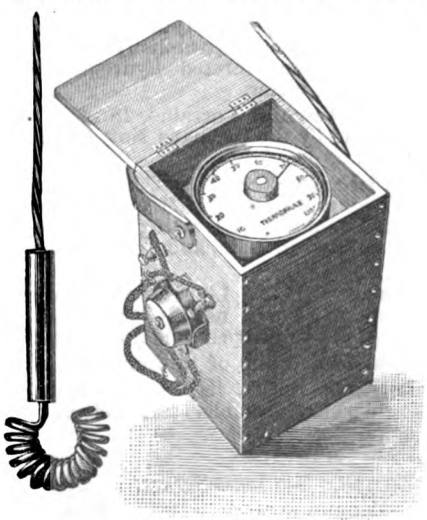
Thermometry. Science of measuring and comparing temperatures. The ordinary thermometer consists of a capillary glass tube terminating in a bulb, and the whole partly filled with mercury. The expansion and contraction of mercury is greater than that of glass; so, if the tube be properly graduated, the position of the mercury surface will indicate the temperature of the instrument. Any instrument used to detect the presence of heat is called a thermoscope, and its arbitrary graduation will enable it to be used as a thermometer. An apparatus for obtaining a continuous automatic record of the indications of a thermometer is called a thermograph. A sheet of sensitive paper is made to move



Thermograph.

uniformly behind and at right angles to the length of a thermometer placed in front of a narrow vertical slit in a blackened screen. If this be illuminated from the front, that part of the tube above the mercury only is transparent, and the rising and falling of the mercury, combined with the horizontal motion of the paper, causes the line of separation of the affected and unaffected parts of the paper to be curved or wavy; the height of the curve above a certain datum line is a measure of the temperature at each instant of the day. Self-registering thermometers are divided into MAXIMUM THERMOMETERS (q.v.) and MINIMUM THERMOMETERS (q.v.). Leslie of Edinburgh invented an instrument for detecting small differences of temperature, called a DIFFERENTIAL THERMOMETER (q.v.). See CENTIGRADE, FAHRENHEIT, and REAUMUR.

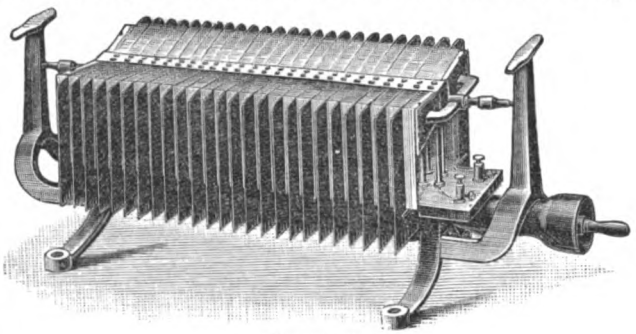
Thermophone. Electrical thermometer used to determine the temperature of a distant or inaccessible place. It is of the resistance type and depends upon the principle that the resistance of a conductor to the electrical current varies with



Thermophone.

its temperature. It is extremely sensitive and is used to take the temperature of water at different depths, the temperature of soils in agricultural work, and in places where a constant temperature is desired.

Thermopile. Thermoelectric generator, consisting in its simplest form of a circuit of two metals, one junction being maintained at a higher temperature than the other. That heat can thus be transformed into electric energy was discovered by Seebeck 1821. The thermomultiplier of Nobili and Melloni (1834), which may be used as a delicate thermoscope,



Thermopile.

was constructed of bismuth and antimony. The modern devices of Noë and Clamond are made of a zinc-antimony alloy, coupled with German silver or iron. The difference of potential due to a single couple is very small, and usually many couples are joined in series to increase the effect.

Thermopylæ. Pass from Thessaly s., between Mt. Œta and the Malice Gulf. At one point it offered room for but a single carriage. Here Leonidas with 300 Spartans and 700 Thespians withstood for two days the mighty host of Xerxes, 480 B.C. Here Brennus entered Greece 279 B.C., and here Antiochus was defeated by the Romans 191 B.C.

Thermoscope. See THERMOMETRY.

Thermostat. Self-acting instrument for regulating the temperature of a given space. Its action may depend upon the differential expansion principle, and it may be attached, *e.g.*, to heat-regulating part of a furnace.

Thermotropism. Phenomena of curvature of growing vegetable organs, induced by the dark rays of the spectrum.

Theroigne de Mericourt. Assumed named of TERWAGNE, ANNE JOSEPHE (q.v.).

Theromorpha. Order of extinct reptiles whose fossils are found in Permian and Triassic fresh-water deposits of s. Africa. They are connecting links to mammals. The limbs are ambulatory, the pelvis and shoulder-girdle firm. The vertebræ are biconcave, teeth few or none. *Dicynodon* had walrus-like tusks and a beak like a tortoise. Several suborders are here included, some of which connect with order RHYNCHOCEPHALIA (q.v.). The *Theromorpha* were so named by Cope as possessing characters connecting them with the lowest mammals, the Monotremes; they were remarkable generalized types connecting amphibians, reptiles, and mammals, and believed by Cope and Owen to be the probable ancestors of the marsupial mammals of the Upper Triassic.

Thersites. Character in the *Iliad*, deformed in body and mind. He railed at the Greek chiefs, and was slain by Achilles.

Théry, ANTOINE THÉODORE JOSEPH, 1807–1896. French life Senator 1875.

Theseus. Legendary hero of Attica, rival of the exploits of Hercules. He slew the Minotaur in Crete, and escaped from the labyrinth by help of Ariadne's clew; became King of Athens; fought the Amazons; was one of the Argonauts; joined in the Calydonian hunt; aided the Lapithæ against the Centaurs; and was believed to have come from the grave to aid the Athenians at Marathon.

Thesiger. See CHELMSFORD.

Thesmophoria. Greek festival in honor of Demeter; celebrated by the women of several cities, particularly Athens, Abdera, Sparta, and Thebes.

Thesocytes. Cells in sponges that serve the purpose of storing oil and amylin for the general use of the sponge economy.

Thespis, 6th cent. B.C. Traditional founder of Greek tragedy.

Thessalonians, EPISTLES TO. 13th and 14th N.T. books, written by St. Paul ab. 53 and 54.

Thessalonica. See SALONICA.

Thessaly. Largest section of Greece; e. of Epirus; never of great importance in Greek history; subjected by Philip of Macedon 344 B.C., and by Rome at the battle of Cynocephalæ

197 B.C.; ceded to Greece by Turkey 1881; occupied by Turkish troops 1897. It is a plain almost surrounded by moun-

The Mountain Monasteries.

tains and is divided by a series of transverse chains. Numerous monasteries are found here.

Thetis. Sea-nymph, daughter of Nereus. She had, like Proteus, the power of assuming any shape she pleased. Peleus, by Chiron's instruction, held her fast till she resumed her proper form and promised to marry him. By him she became the mother of Achilles.

Theudas. Leader of a Jewish revolt, mentioned Acts v. 36.

Theurgy. Supposed magical science, by which the will of the gods could be affected; believed in by some Neoplatonists ab. 400–500.

Theuriet, ANDRÉ, b. 1833. French novelist, poet, dramatist, and critic. *Mdlle. Guignon*, 1874; *Bastien-Lepage*, 1885.

Thévet, ANDRÉ, 1502–1590. French writer on America. *Cosmographie*, 1571; *Hommes illustres*, 1584.

Thian-Shan, or TIEN-SHAN. Range of high mountains between Russian and e. Turkestan; part of the n. boundary of the great plateau of central Asia.

Thibaud, PIERRE, 1739–1804. French ethnologist. *Origine des Indiens*, 1787–1801; *Hist. Aztec*, 1796.

Thibaudeau, ANTOINE CLAIRE, 1765–1854. French Deputy 1792, Councilor of State 1800, Count 1803; in exile 1815–30; Senator 1852; historian of the Directory 1824, of Napoleon 1827–28, and of the *Consulate and Empire*, 10 vols., 1835. *Mémoires*, 1875.

Thibaudin, GASTON LOUIS, 1727–1796. French botanist, in S. America and Cuba 1777–85, and from 1792. *Flore du Chili*, 4 vols., 1788; *Flore du Perou*, 4 vols., 1790.

Thibault, ANATOLE FRANCOIS ("ANATOLE FRANCE"), b. 1844. French novelist and dramatist; literary critic of *Le Temps*. *Jocaste; Jean Servan's Desires; Crime of Sylvestre Bonnard.*

Thibaut, 1201–1253. King of Navarre 1234. French lyrical poet.

Thibaut, ANTON FRIEDRICH JUSTUS, 1774–1840. Prof. Kiel 1798, Jena 1803, and Heidelberg from 1806; important writer on Roman law, 1799, and the Pandects, 1803.

Thibet. See TIBET.

Thick-knee (STONE PLOVER). Plover-like intertropical

Thick-knee (*Oedicnemus crepitans*).

bird, with enlarged tarsal joints, no hind toe, and pointed wings. A single species extends to England. It is nocturnal, and feeds in marshes on insects, snails, etc. In Central America it is protected because it destroys insects that attack cattle.

Thierry, JACQUES NICOLAS AUGUSTIN, 1795–1856. French historian of the Norman Conquest of England, 1825, and of the Merovingian Age, 1840. His works are noted for picturesque style, and are familiar in English versions.—His brother, AMÉDÉE SIMON DOMINIQUE, 1797–1873, Councilor 1838, Senator 1860, wrote histories of Gaul, 1828–47, and of Attila, 1856.

Thiers, LOUIS ADOLPHE, 1797–1877. French historian, journalist, and statesman; Deputy 1830, Minister 1832; Academician 1834; Premier 1836 and 1840; usually active in opposition; Pres. of the Republic 1871–73, Senator 1876. His *Hist. French Revolution*, 10 vols., 1823–27, and *Consulate and Empire*, 20 vols., 1845–60, are important works, but not of the highest rank.

Thiersch, FRIEDRICH WILHELM, 1784–1860. Classical prof. at Munich from 1812; writer on history and education.—His son, HEINRICH WILHELM JOSIAS, 1817–1885, was prof. at Marburg 1843–50, and thenceforth Irvingite pastor in Germany, Switzerland, and Austria. *Hist. Ch.*, tr. 1852; *Genesis*, tr. 1878.

Thietmar, 976–1018. Saxon chronicler; Bp. of Merseburg, near Leipzig, 1009.

Thieves' Jargon. Use of a special patter or dialect among thieves, partly to disguise their speech, is common throughout Europe, and in India and other parts of the East. English cant, or Thieves' Latin, is made up partly of archaic and foreign words, but in greater part of arbitrary and conventional expressions of a low, coarse and foolish character. In s. China, the secret language of thieves is characterized by the employment of substituted words in a metaphorical sense.

Thijm, JOSEPHUS ALBERTUS ALBERDINGK, 1820–1888. Dutch poet, historian, novelist, and critic.

Thilo, JOHANN CARL, 1794–1853. Prof. Halle 1822; ed. N. T. Apocrypha 1832–46.

Thimbleberry. See RASPBERRY.

Thin Plates, COLORS OF. Iridescence is produced by the interference of rays reflected from the upper and lower surfaces of thin plates, as in soap-bubbles or oil-films. See NEWTON'S RINGS.

Thio. Prefix used by many writers for sulp or sulpho, meaning that the compound to which it is applied contains sulphur.

Thio Acids. Acids in which more or less oxygen is replaced by sulphur. Thus thioacetic acid is $CH_3.COSH$.

Thio Alcohols. Alcoholic compounds containing the group .SH instead of .OH; also called Mercaptans. See ALCOHOLS.

Thio Aldehydes. ALDEHYDES (q.v.) containing the group .CHS instead of .CHO.

Thiocarbonates. Salts of the thiocarbonic acid; carbonates containing sulphur in place of oxygen, as K_2CS_3.

Thioketone. KETONE (q.v.) in which the group CO is replaced by CS.

Thionic Acids. See DITHIONIC ACID.

Thionine. $C_{12}H_{10}N_3SCl$. Hydrochloride of the substance produced by the oxidation of paraphenylenediamine in an acid solution containing sulphureted hydrogen; green powder, easily soluble in hot water.

Thionville. Town of Lorraine, 18 m. n. of Metz; taken by Condé 1643, and by the Germans Nov. 1870; since German. Pop., 1890, 8,928.

Thionyl Chloride. $SOCl_2$. Colorless or yellow fuming liquid of bad odor and irritating effect upon the mucous membrane; bpt. 82° C.; made by treating phosphorous pentachloride with dry sulphur dioxide, and fractionating the resulting compounds.

Thiophene. C_4H_4S. Liquid very similar to benzene, present in coal tar; hence usually present in benzene; bpt. 84° C. In chemical properties it is an aromatic substance.

Thiosulphates. Salts of thiosulphuric acid.

Thiosulphuric Acid. $H_2S_2O_3$. Formerly called hyposulphurous acid; very unstable. Salts are made by dissolving sulphur in sulphites.

Third. See INTERVALS.

Third Estate. See TIERS ÉTAT.

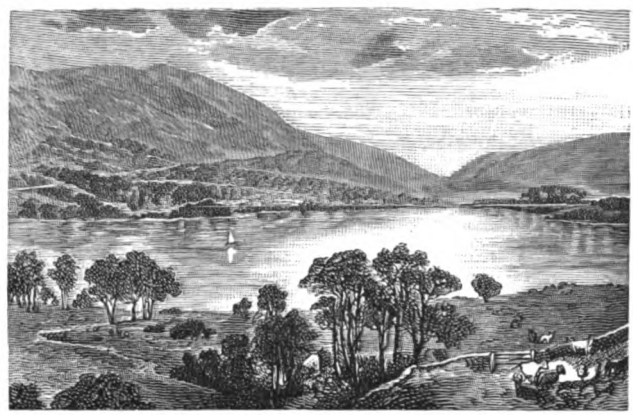
Thirion, EUGENE ROMAIN, b. 1839. French painter.

Thirlage. In Scotland, a servitude, by which the possessor of lands was bound to carry all his grain to a certain mill to be ground, paying from a thirtieth to a twelfth part therefor, besides perquisites to the servants.

Thirling, or THURLING. Small hole or passage, cut for

purposes of ventilation through the rib or pillar that separates two parallel drifts or rooms in a coal mine.

Thirlmere. Lake in s.w. of Cumberland, England. It belongs to the basin of the Derwent, and flows n. into the Greta. Its level has been raised from 533 ft. covering an area



Thirlmere and Helvellyn.

of 330 acres to 584 ft. covering an area of 793 acres, by an embankment at the natural outlet. By an aqueduct having a capacity of 50,000,000 gallons a day, it supplies 10,000,000 gallons to Manchester.

Thirlwall, CONNOP, D.D., 1797–1875. Bp. of St. David's 1840–74; O.T. reviser; most liberal prelate of his time, voting for Irish disestablishment and the admission of Jews to Parliament, and refusing to demand Bp. Colenso's resignation. His *History of Greece*, 1835–40, enlarged in 8 vols. 1845–52, is of high rank. *Remains*, 1875–76; *Letters*, 1881–82.

Thirst. Simple desire for, or absolute want of, liquids. Its symptoms are dryness of the mouth and pharynx. It is relieved by introduction of liquid into the stomach, where it is absorbed by the veins. It is a symptom in many diseases, particularly in those of vascular excitement.

Thirty-nine Articles. Framed 1552 by Cranmer, Ridley, and other reformers, as 42; abridged, and approved by Convocation in their Latin form 1562, and in English 1571; bound with the Prayer Book in England and America, and long regarded as part of it. Subscription to them was required of members of the universities till 1871.

Thirty Tyrants. 1. After the fall of Athens 404 B.C. the Athenian assembly appointed a committee of 30 to draw up laws for the city and temporarily administer the government. They ruled eight months and earned their name by extreme violence and cruelty; 1,500 citizens are said to have been put to death without trial. 2. Usurpers in various Roman provinces during the imbecile reign of Gallienus. The chief were Postumus, Victorinus, and Tetricus, in Gaul 258–273. Gibbon could name but 17 in all.

Thirty Years' War. In Germany 1618–48. Austria, in alliance with Spain, and most of the R.C. States of Germany, contended with different powers. It began with an uprising in Bohemia, provoked by violation of the edict of toleration of July 11, 1609. Ferdinand II. was deposed as King of Bohemia and the Elector Palatine chosen in his stead. 1618–24 the war was carried on between the princes of Germany; the chief Protestant leaders were Count Mansfeld, Christian of Brunswick, and Bethlem-Gabor. The emperor recovered Bohemia, and crushed Protestantism there, but lost much of Hungary and Transylvania. In 1624, Christian IV. of Denmark came to the aid of the Protestants: he was routed by Tilly Aug. 1626, as was Mansfeld by Wallenstein April 1626. The death of Mansfeld followed a successful raid through Silesia, Moravia, and Hungary. Christian was forced to conclude peace, at Lübeck, May 1629. Ferdinand's increasing persecutions and his insulting conduct toward Gustavus Adolphus brought in the Swedish army, 1630, who soon conquered Pomerania and Mecklenburg. Gustavus routed Tilly at Beltenfeld 1631, and on the Lech April 1632; and entered Munich, but was drawn back by Wallenstein to Saxony, where he fell at Lützen, his army gaining the victory. The defeat of Weimar at Nordlingen led to the treaty of Prague, May 1635, soon joined by all the Lutheran princes of Germany. Sweden now resigned the leadership to Richelieu, but her generals won a series of victories, till the Austrians were driven beyond the Danube. The power of Spain in the Netherlands was broken by France, and at Nordlingen, Aug. 3, 1645, Condé and Turenne obtained a decisive victory over the leaguers. An invasion of Austria was cut short by the Peace of Westphalia, signed 1648, after 7 years of negotiation. The war was terribly destructive to life, property, and every interest of civilization.

Thisbe. See PYRAMUS AND THISBE.

Thistle. Coarse, prickly herbs of the genus *Carduus*, natural order *Compositæ*, natives of the n. temperate zone. The Canada Thistle, *C. arvensis*, native of Europe, introduced as a weed into America, is particularly troublesome in both pastures and cultivated fields. It spreads from seeds and underground stems, and is eradicated or checked with great difficulty. When cut early it makes a hay of fair quality that is readily eaten by sheep and cattle. The other thistles are biennials, and may be killed by cutting the second year before the seed is formed.

Canada Thistle (*Carduus arvensis*).

Thistle, BLESSED. *Cnicus benedictus*. Native of Europe, sparingly introduced into the U. S.

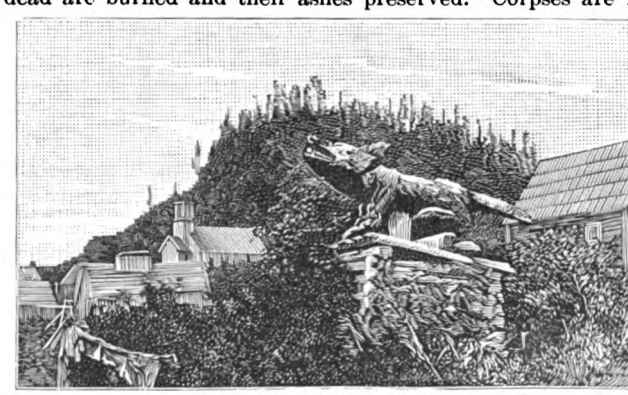
Thistle, COTTON. See THISTLE, SCOTCH.

Thistle, ORDER OF THE. See ST. ANDREW, ORDER OF.

Thistle, RUSSIAN. *Salsola tragus*. Low, profusely branching, annual weed. Late in the season it breaks from the root and is blown about by the wind, thus widely scattering its abundant seeds. It has spread very rapidly on the Western prairies and is exceedingly troublesome. It is not a true thistle, but more nearly related to the pigweeds.

Thistle, SCOTCH. *Onopordon acanthium*. Coarse, prickly-leaved herb of the Composite family, with large purple flowers, native of Europe, introduced as a weed into America; also called Cotton Thistle.

Thlinkit. Pacific coast Indians from the Columbia n. to Mt. St. Elias, Alaska. They are of light color, have bristly black hair, and large eyes. They formerly inserted plugs in the under lip. Before the advent of the whites they worked copper. In war they wear wooden armor: prisoners were tortured to death. They live in houses of hewn logs, and are expert carvers. Cutting the hair is a sign of mourning; the dead are burned and their ashes preserved. Corpses are re-



Grave of Thlinkit Chief.

moved from the house by way of the roof rather than through the door. Though skilled canoeists, they knew not how to swim. Medicine men are wanting. The southern Thlinkit are the Haidah Indians; the Aht is their chief tribe. They flatten the head, live on salmon, which they cure, bury the dead in mounds, before which they burn salmon, and are noted for their theatrical performances.

Tholobate. Substructure below a cupola or dome.

Tholuck, FRIEDRICH AUGUST, 1799–1877. Prof. of Theology at Halle 1826; evangelical leader of wide influence. His commentaries and other books have been extensively tr. and read. *Sin and Redemption*, 1824, tr. 1854; *Hours of Devotion*, 1840, tr. 1875; *Rationalism*, 1853–65.

Thom, JOHN HAMILTON, ab.1810–1894. Unitarian pastor at Liverpool. *Revelation*, 1859.

Thom, WILLIAM, 1799–1848. Scottish weaver-poet.

Thomas, ST., or DIDYMUS. One of the twelve apostles; of a melancholy temperament, but deeply devoted to his Master; said to have preached in Persia and India and been martyred. His doubt of Christ's resurrection was the demand of an honest, accurate mind for evidence. Both his names mean "twin."

Thomas, ABEL CHARLES, 1807–1880. Pastor in Phila. *Centenary of Universalism*, 1872.

Thomas, ARTHUR GORING, 1851–1892. English composer of the operas *Esmeralda*, 1883, and *Nadeshda*, 1885, and cantatas *Sun Worshipers* and *Swan and the Skylark*.

Thomas, CHARLES LOUIS AMBROISE, 1811–1896. Director Paris Conservatoire from 1871; composer of 20 operas and many cantatas and minor pieces. *Le Songe d'une Nuit d'été*, 1850; *Mignon*, 1866; *Hamlet*, 1868.

Thomas, CYRUS, b.1825. Member U. S. Entomological Commission 1877, and Bureau of Ethnology 1882. *Insects of Illinois*, 5 vols., 1876–80; *Mt. Troano*, 1882; Maya and Mexican MSS., 1884; *Burial Mounds*, 1888.

Thomas, DAVID, 1794–1882. Welsh ironmaster, in Pa. from 1839.

Thomas, DAVID, D.D., b.1813. Independent minister in London 1845–74; ed. *Homilist*, 1851–82.

Thomas, EDITH MATILDA, b.1854. American poet and essayist.

Thomas, FRANCIS, 1799–1876. M.C. 1831–41 and 1861–69; Gov. of Md. 1841–44; U. S. Minister to Peru 1872–75.

Thomas, SIR GEORGE, ab.1705–1775. Gov. of Pa. 1738–47; Baronet 1766.

Thomas, GEORGE HENRY, U.S.A., 1816–1870. Major 1855; Brig.-gen. U. S. Vols. 1861; victor at Mill Springs, Ky., Jan. 20, 1862; Major-gen. April 1862. He turned defeat into victory at Murfreesboro, Tenn., Jan. 2, 1863, and as "the Rock of Chickamauga," Sept. 20, withstood a fierce attack of the best Confederate troops, and nullified their success, in one of the most critical actions of the war. He now became commander of

General Thomas.

the army of the Cumberland, and Brig.-gen. U.S.A. He won the battle of Nashville Dec. 15, 16, 1864, nearly annihilated Hood's army, and was made Major-gen. U.S.A. After the war he held commands in the Southwest, and did much for reconstruction. A Virginian, his loyalty involved great though silent sacrifices, and was long under unjust suspicion. He was a noble character, and the greatest of the Union generals after Grant, Sherman, and possibly Sheridan.

Thomas, HENRY GODDARD, b.1837. Col. 2d U. S. colored regiment Feb. 1863; Brig.-gen. U. S. Vols. 1864–66, serving in Va.—His brother, WILLIAM WIDGERY, b.1839, was U. S. Minister to Sweden 1883–85 and 1897.

Thomas, ISAAC, 1735–1819. Va. scout, active in border warfare and in the settlement of Tenn.

Thomas, ISAIAH, LL.D., 1749–1831. Printer and publisher of Boston and Worcester, Mass.; founder American Antiquarian Society 1812. *Hist. Printing in America*, 1810.

Thomas, JESSE BURGESS, 1777–1853. U. S. Senator from Ill. 1818–29; introducer of the Missouri Compromise 1820.—His great-nephew, JESSE BURGESS, D.D., b.1832, became prof. in Newton Theol. Inst., Mass., 1887. *Bible and Science*, 1877.

Thomas, JOHN, 1725–1776. Mass. surgeon; Brig.-gen. 1775, Major-gen. 1776; Montgomery's successor before Quebec.

Thomas, JOHN, 1805–1871. Founder of the Christadelphians, a non-trinitarian sect, in the U. S. ab.1855, and in England 1860.

Thomas, JOHN, 1813–1862. English sculptor and architect.

Thomas, JOSEPH, M.D., LL.D., 1811–1891. American compiler. His *Gazetteer*, 1855, *Medical Dictionary*, 1864, and *Dict. Biography and Mythology*, 1870–71, are widely used.—His brother, JOHN J., 1810–1895, edited the *Country Gentleman* from 1853. *Fruit Culturist*, 1846.

Thomas, LORENZO, U.S.A., 1804–1875. Brig.-gen. 1861, Adjutant-gen. 1861–63; organizer of colored regiments 1863–65.

Thomas, MARY F. (MYERS), M.D., 1816–1888. American reformer, champion of temperance and woman suffrage.

Thomas OF CELANO. Franciscan monk of 13th century, supposed author of the magnificent requiem, *Dies Iræ*.

Thomas OF LONDON. See THOMAS À BECKET.

Thomas, PHILIP FRANCIS, 1810–1890. M.C. 1839–41 and 1875–77; Gov. of Md. 1848–51; Sec. U. S. Treasury Dec. 1860–Jan. 1861.

Thomas, ROBERT BAILY, 1766–1846. Ed. *Farmer's Almanac*, Boston, from 1793.

Thomas, ST., CHRISTIANS OF. See CHRISTIANS OF ST. THOMAS.

Thomas, THEODORE, b.1835 in Germany. Organizer of symphony concerts in New York 1864; conductor of the Philharmonic Society 1877–90, and since of the Chicago Orchestra; director of the College of Music of Cincinnati 1878–80, of music festivals there since 1873, and of the music of World's Columbian Exposition in Chicago 1893.

Thomas, THEODORE GAILLARD, M.D., LL.D., b.1831. Prof. New York 1862; Pres. Gynæcological Society 1879. *Diseases of Women*, 1868.

Thomas à Becket. See BECKET.

Thomas à Kempis. See KEMPIS.

Thomas Aquinas. See AQUINAS.

Thomas-Gilchrist Process. See STEEL, METALLURGY OF.

Thomasius, CHRISTIAN, 1655–1728. Prof. of Jurisprudence at Leipzig 1681, and Halle 1694. He substituted German for Latin in teaching, opposed torture and trials for witchcraft, and defended Spener and the pietists. *Weisheit und Thorheit*, 1693; *Gedanken*, 1723–26.—His descendant, GOTTFRIED, 1802–1875, prof. Erlangen from 1842, pub. *Origenes*, 1837; *Christi Person und Werk*, 1852–61; and *Dogmengeschichte*, 1874–76.

Thomassin, LOUIS, 1619–1697. French oratorian. *Bénéfices*, 3 vols., 1678–79.

Thomas the Rhymer. See RHYMER.

Thomayer, JOSEF ("R. E. JAMOT"), b.1853. Prof. of Medicine at Prague; author of professional works and scientific novels.

Thomes, WILLIAM HENRY, b.1824. Californian writer of stories of travel.

Thomists. Followers of AQUINAS (q.v.).

Thompson, ALEXANDER RAMSAY, D.D., b.1822. Reformed pastor in New York and Brooklyn; hymnist and compiler.

Thompson, AUGUSTUS CHARLES, D.D., b. 1812. Cong. pastor at Roxbury, Mass.; devotional writer.

Thompson, BENJAMIN. See RUMFORD.

Thompson, CEPHAS GIOVANNI, 1809–1888. American painter, especially of portraits, as was his father, CEPHAS, 1775–1856.—His brother, JEROME, 1814–1886, was a landscape and genre painter. All three were mainly self-taught.

Thompson, DANIEL GREENLEAF, 1850–1897. New York lawyer and author, pres. 19th Century Club. *Psychology*, 1884; *Problem of Evil*, 1886; *Social Progress*, 1889; *Philosophy of Fiction*, 1892.

Thompson, DANIEL PIERCE, 1795–1868. American novelist. *Green Mountain Boys*, 1840; *Hist. Montpelier* (Vt.), 1860.

Thompson, DAVID, 1770–1857. Canadian explorer.

Thompson, EDWARD MAUNDE, b.1840. Librarian of the British Museum. *Greek and Latin Paleography*, 1893.

Thompson, ELIZABETH (ROWELL), b.1821; m. Thomas T. 1844. American philanthropist, interested in temperance and the condition of the poor. In 1885 she established a fund for scientific research.

Thompson, ELIZABETH S. See BUTLER, E. S.

Thompson, GEORGE, 1804–1878. English abolitionist, influential in the U. S. 1834–35; M.P. 1847.

Thompson, HENRY, 1797–1878. English author and translator; biographer of Hannah More 1838; editor of Horace and Virgil 1853–54.

Thompson, SIR HENRY, b.1820. English surgeon, painter, and novelist. *Lithotomy*, 1863; *Urinary Organs*, 1868; *Cremation*, 1890.

Thompson, HENRY DENMAN, b.1833. American actor, best known in *The Old Homestead*, 1891–95.

Thompson, HUGH MILLER, D.D., LL.D., b.1830 in Ireland. Prof. Nashotah Theol. Sem., Wis., 1860–71; ed. *American Churchman* 1860–71, and *Ch. Journal* 1871–79; rector in New York 1872–76, and New Orleans 1876–83; asst. Bp. of Miss. 1883, Bp. 1887. *First Principles*, 1868; *Copy*, 1872; *World and Logos*, 1885.

Thompson, JACOB, 1810–1885. M.C. from Miss. 1839–57; U. S. Sec. Interior 1857–61; Gov. of Miss. 1862–64; Commissioner C.S.A. to Canada 1864.

Thompson, JAMES, 1806–1874. M.C. 1845–51; Judge Pa. Supreme Court 1857–66; Chief-justice 1866–72.

Thompson, JOHN BURTON, 1810–1874. M.C. from Ky. 1840–43 and 1847–51; U. S. Senator 1853–59; Unionist.

Thompson, JOHN REUBEN, 1823–1873. Va. poet; ed. *Southern Literary Messenger* 1847–59.

Thompson, SIR JOHN SPARROW DAVID, 1844–1894. Atty.-gen. of Canada 1885; knighted 1888; Premier 1892.

Thompson, JOSEPH PARRISH, D.D., LL.D., 1819–1879. Cong. pastor in New York 1845–71; in Berlin from 1871. *Egypt*, 1856; *Theology of Christ*, 1870; *The U. S. as a Nation*, 1877.

Thompson, LAUNT, 1833–1894. Irish-American sculptor, in Italy 1875–81.

Thompson, MAURICE, b.1844. American poet, novelist, and essayist; State Geologist of Indiana 1885. *Witchery of Archery*, 1878; *A Tallahassee Girl*, 1882; *Sylvan Secrets*, 1887; *Story of Louisiana*, 1888.

Thompson, MERRIWETHER JEFF, 1826–1876. Brig.-gen. C.S.A. 1861–65, serving in the West; engineer and inventor.

Thompson, MORTIMER ("Q. K. PHILANDER DOESTICKS"), 1832–1875. American humorist. *Pluribustah*, 1856, a travesty on Longfellow's *Hiawatha*.

Thompson, RICHARD WIGGINGTON, b.1809. M.C. from Ind. 1841–43 and 1847–49; Sec. Navy 1877–81.

Thompson, ROBERT ANCHOR, b.1821. Anglican divine. *Theism*, 1855; *Becket*, 1889.

Thompson, ROBERT ELLIS, D.D., b.1844. Prof. Univ. Pa. 1870–92; pres. Phila. High School 1894; ed. *Penn. Monthly* 1870–80, and *American* 1880–91. *Social Science*, 1875–82; *Protection*, 1886.

Thompson, SILVANUS PHILLIPS, b.1851. English electrician. *Dynamo-electric Machinery*, 1885.

Thompson, SMITH, LL.D., 1768–1843. Justice N. Y. Supreme Court 1802–1814; Chief-justice 1814–18; Sec. Navy 1818–23; Justice U. S. Supreme Court from 1823.

Thompson, THOMAS PERRONET, 1783–1869. M.P. 1835; writer on politics, mathematics, and acoustics.

Thompson, WADDY, 1798–1868. M.C. from S. C. 1835–41; Minister to Mexico 1842–45. *Mexico*, 1846.

Thompson, WILLIAM, ab.1725–1781. Col. Pa. troops 1775; Brig.-gen. 1776.

Thompson, WILLIAM HEPWORTH, D.D., 1810–1886. Greek prof. at Cambridge 1853; master Trinity Coll. 1866.

Thompson, WILLIAM TAPPAN, 1812–1882. Georgia humorist. *Major Jones' Courtship*, 1840; *Chronicles of Pineville*, 1843; *Sketches*, 1848–83.

Thompson, WORDSWORTH, 1840–1896. N. A. 1874. American painter of colonial and early American life. His *Deserted Inn* was shown at the World's Columbian Exposition, Chicago, 1893.

Thompson, ZADOC, 1796–1856. Historian of Vermont 1833, 1841, 1853.

Thoms, WILLIAM JOHN, 1803–1885. English antiquarian and compiler; founder and ed. *Notes and Queries*, 1849–72. *Early Prose Romances*, 1828; *Lays and Legends*, 4 vols., 1834; *Anecdotes and Traditions*, 1838; *Longevity*, 1873.

Thomsen, CHRISTEN JÜRGENSEN, 1788–1865. Danish antiquarian.

Thomsenolite. $Na_2Ca_2Al_2F_{12}+2aq$. Hydrous calcium sodium aluminium fluoride, found associated with the cryolite of Greenland.

Thomson, ANTHONY TODD, M.D., 1778–1849. Prof. London. *Dispensatory*, 1811; *Materia Medica and Therapeutics*, 1832–33. —His wife, KATHERINE (BYERLY), 1800–1862, as "Grace Wharton," pub. *Jacobites of 1715 and 1745*, 3 vols., 1845–46; *Wits and Beaux of Society*, 1860, and similar books.

Thomson, CHARLES, 1729–1824. Sec. Congress 1774–89; tr. Bible 1808.

Thomson, SIR CHARLES WYVILLE, LL.D., 1830–1882. Prof. Cork 1853, Belfast 1854, and Edinburgh 1870–79; knighted 1876; head of the *Challenger* expedition 1872–76. From a study of the nature of the mud covering the Atlantic bed, he favored the theory that the present deep-sea basin of the Atlantic has been such during the entire Tertiary period and that some of the microscopic organisms now living there are the lineal descendants of those of the Cretaceous period. *Depths of the Sea*, 1872; *Voyage of the Challenger*, 1877.

Thomson, EDWARD, D.D., LL.D., 1810–1870. Pres. Ohio Wesleyan Univ. 1848–60; ed. *Christian Advocate* 1860–64; M.E. bishop 1864. *Essays*, 1856; *Letters*, 1856–70.

Thomson, ELIHU, b.1853. American electrician.

Thomson, JAMES, 1700–1748. Scottish descriptive and dramatic poet. His *Seasons*, 1726–30, and *Castle of Indolence*, 1748, are minor classics; his plays are of less importance.

Thomson, JAMES, 1834–1882. Scottish poet, of pessimistic views and unhappy life. *City of Dreadful Night*, 1874–80; *Shelley*, 1885; *Critical Studies*, 1896.

Thomson, JOHN EDGAR, 1808–1874. Chief engineer Pa. R.R. 1847, and its pres. from 1852.

Thomson, JOHN RENSHAW, 1800–1862. U. S. Senator from N. J. from 1853.

Thomson, JOSEPH, 1858–1895. Scottish explorer in Africa 1878, 1882, and 1890. *Through Masai Land*, 1885; *Ulu*, 1888; *In the Atlas*, 1889.

Thomson, JOSEPH JOHN, b.1856. Prof. Cambridge 1884; writer on physics, electricity, and magnetism.

Thomson, SAMUEL, 1769–1843. New England founder of a system of medicine. *Life and Discoveries*, 1825–32.

Thomson, THOMAS, 1768–1852. Scottish antiquarian.—His brother, JOHN, 1778–1840, minister of Duddingston from 1805, was eminent as a landscape painter.

Thomson, THOMAS, 1773–1852. Prof. of Chemistry Univ. Edinburgh 1818. *Hist. Chemistry*, 1830; *Mineralogy and Geology*, 1836.

Thomson, WILLIAM, D.D., F.R.S., 1819–1890. Bp. of Gloucester and Bristol 1861, Abp. of York 1863. *Laws of Thought*, 1842; *Atoning Work*, 1854.

Thomson, WILLIAM (LORD KELVIN), F.R.S., b.1824. Prof. of Natural Philosophy Univ. Glasgow since 1846; eminent as mathematician and physicist; knighted 1866 for services to Atlantic cable; pres. British Association 1871, and Royal Society 1891; Peer 1892. *Mathematical and Physical Papers*, 3 vols., 1882–90; *Lectures*, 1890–92.—His brother, JAMES, LL.D., F.R.S., 1822–1892, Prof. of Engineering at Belfast 1853–72, and Glasgow 1873–89, was especially learned in hydraulics.

Thomson, WILLIAM MCCLURE, D.D., 1806–1894. American missionary in Syria 1833–76. *The Land and the Book*, 1859, enlarged 1880–86; *Land of Promise*, 1865.

Thomson Effect. See PELTIER'S EFFECT.

Thomsonite. Zeolitic mineral; hydrous sodium calcium aluminium silicate. A fibrous or radiated variety, that takes a good polish, has been found in water-worn material on the shore of Lake Superior.

Thor. In Norse Mythology, god of the sky, of thunder,

war, fire, and the hearth; son of Odin; champion of the Æsir, or gods of Valhalla, against the Jötuns, or giant forces of Nature.

Thoracic Duct. In man this extends upward from the receptaculum chyli to the junction of the left jugular and subclavian veins, into which it delivers the lymph of the left side of the body and of both legs and all the chyle; valves permit only an upward flow. Birds have two such ducts.

Thoracic Fins. See FINS OF FISHES.

Thoracipoda. See MALACOSTRACA.

Thoracostraca (PODOPHTHALMATA). Division of *Crustacea*, *Malacostraca*, characterized by compound eyes, usually placed on movable stalks, and by a fold of skin which forms a dorsal shield or carapace, covering most of the thoracic segments, and uniting them to the head. The suborders *Cumacea*, *Stomatopoda*, *Schizopoda* and *Decapoda* are included.

Thorah. Jewish law or books of Moses; celebrated of old in Babylon after the Feast of Tabernacles.

Thorax. Chest; middle region of an insect's body (three segments bearing the legs), and portion of the body in *Crustacea* which bears the pereiopods (five pairs of walking legs on as many ankylosed segments in Lobster).

Thorburn, GRANT ("LAWRIE TODD"), 1773–1863. Scottish-American merchant and author. *40 Years in America*, 1834; *50 Years of New York*, 1845.

Thoreau, HENRY DAVID, 1817–1862. American essayist, noted for originality, independence of mind and character, aversion to conventionalities, and close observation and portraiture of nature. He lived at Concord, Mass., poor, secluded, known to few, a cheerful stoic, a severe critic of men and their

Henry David Thoreau.

ways, a lover of the woods and his own thoughts. Many of his sayings are memorable and stimulating. *A Week on the Concord and Merrimac*, 1849; *Walden*, 1854. His other books are reprints of fugitive articles, or collected from his MS. notebooks, posthumous, like his fame.

Thoresby, RALPH, F.R.S., 1658–1725. English antiquarian, writer on Leeds. *Museum Thoresbianum*, 1824; *Diary*, 1830; *Correspondence*, 1832.

Thoresen, ANNA MAGDALENA (KRAGH), b.1819. Norwegian novelist and dramatist.

Thorfinn. Norwegian navigator, who, the *Sagas* say, sailed for Greenland 1006 and for Vinland 1007, with 3 ships and 160 persons, and spent 3 years in a bay on the New England coast, returning 1611.

Thorild, THOMAS, 1759–1808. Prof. Greifswald; Swedish political writer. *Works*, 1873–74.

Thorite. $ThSiO_4$. Rare mineral thorium silicate, in some of its characters resembling zircon.

Thorium. Th. At. wt. 232.6, sp. gr. 7.65–7.79, sp. ht. .027, valence IV.; discovered by Berzelius 1828; found principally in THORITE and MONAZITE (q.v.); rare metal, prepared by igniting its chloride with sodium; gray powder, taking fire on being heated; soluble in nitric acid. Thorium oxide with the addition of 0.3 per cent cerium oxide is the basis of most incandescent lights.

Thorium Chloride. $ThCl_4$. White shining tablets, obtained by heating the oxide, ThO_2, with carbon, in a current of chlorine.

Thorn. Town of w. Prussia, on the Vistula; founded 1231; held by Poland 1454–1793; five times besieged; birthplace of Copernicus. A conference held here Oct.–Nov. 1645 vainly attempted to reunite Protestants and R. Catholics. Pop., 1890, 26,712.

Thorn. Spiny shrubs and small trees of the genus *Cratægus*, natural order *Rosaceæ*, natives of the n. temperate zone. See SPINE.

Thorn, BLACK. 1. *Prunus spinosa*. Native plum of Europe, introduced in America. 2. Locally *Cratægus tomentosa*, a native thorn of the e. U. S.

Thorn, BOX. *Lycium barbarum*. Vine of the natural family *Solanaceæ*, native of the Mediterranean region, much planted in old gardens.

Thorn, FRANK MANLY, b.1836. Supt. U. S. Coast Survey 1885–89.

Thorn-Apple. Plants of the genus *Datura*, that are in general narcotic, and productive of wild excitement. *D. stramonium*, the common Thorn-apple, contains the alkaloid da-

Common Thorn-apple (*D. stramonium*): *a*, ripe fruit.

turine. Its leaves and roots are used in medicine. *D. metel*, native of Asia, was employed by the Thugs of India to stupefy their victims. The Indians of Peru make the narcotic drink Tonga from *D. sanguinea*.

Thornbury, GEORGE WALTER, 1828–1876. English novelist, historical writer, and compiler.

Thorndike, HERBERT, ab.1598–1672. Canon of Westminster 1661. *Hebrew Lexicon*, 1635. *Works*, 6 vols., 1844–57.

Thornhill, SIR JAMES, 1676–1734. English painter, knighted 1715; teacher of Hogarth.

Thornton, SIR EDWARD, D.C.L., LL.D., b.1817. Minister to Brazil 1865–67, and to the U. S. 1867–81; Ambassador to Russia 1881, and to Turkey 1884–87.

Thornton, JAMES SHEPARD, U.S.N., 1826–1875. Executive officer of the *Kearsarge* when the *Alabama* was destroyed, June 19, 1864; Commander 1866, Captain 1872.

Thornton, JOHN WINGATE, 1818–1878. New England genealogist and historical writer.

Thornton, MATTHEW, ab.1714–1803. Delegate to Congress 1776–77; signer of the Declaration of Independence; Judge N. H. Superior Court 1776–82.

Thornton, ROBERT JOHN, 1760–1827. Prof. of Botany in London. *Herbal*, 1810; *British Flora*, 1812; *Botany*, 1812.

Thornton, WILLIAM, d.1827. Architect of the first Capitol at Washington; Supt. Patent Office from 1802. *Cadmus*, 1793.

Thornton, SIR WILLIAM, ab.1775–1840. English officer, made prisoner in Md. 1814; wounded at New Orleans 1815; Lieut.-gen. 1838.

Thornton, WILLIAM THOMAS, 1813–1880. English economist. *Peasant Proprietors*, 1848; *Labor*, 1869.

Thornwell, JAMES HENLEY, D.D., LL.D., 1812–1862. Prof. S. C. Coll. 1838–40, 1841–51, and its pres. 1852–55; prof. Colum-

bia Theol. Sem., S. C., from 1855; moderator O. S. Presb. General Assembly 1847; ed. *Southern Quarterly Review* 1855–57. *Works*, 4 vols., 1871–73.

Thornycroft, JOHN ISAAC, F.R.S., b.1843. English naval architect and inventor.

Thornycroft, WALTER HAMO, R.A., b. 1850. English sculptor.

Thorold, ANTHONY WILSON, D.D., 1825–1895. Bp. of Rochester 1877, of Winchester 1891. *Presence of Christ*, 1869.

Thorough. Epithet applied, in his correspondence, to the policy of the Earl of STRAFFORD (q.v.). He aimed to make Charles I. an absolute monarch, to deprive the courts of all independent authority, and to put the estates and liberties of the people at the disposal of the crown.

Thoroughbass. See HARMONY.

Thoroughbred. 1. Animal descended in all lines from ancestors who were accepted as standard specimens of the breed. The principal standard of improved stock-breeders' associations in the U. S., excepting trotting horses and several breeds of swine, is importation from the home of the breed in Europe. 2. English running horse. See HORSE.

Thorough-Wax. *Bupleurum rotundifolium.* Herb of the natural order *Umbelliferæ*, native of Europe, sparingly introduced as a weed into the U. S.

Thorpe, BENJAMIN, 1782–1870. English editor of many Anglo-Saxon writings. *Northern Mythology*, 1852.

Thorpe, JOHN, 16th cent. English architect.

Thorpe, ROSE HARTWICK, b.1850, m.1871. American poet, author of "Curfew must not ring to-night."

Thorpe, THOMAS BANGS, 1815–1878. American novelist and painter. *Lynde Weiss*, 1854; *Bee-hunter*, 1854; *Scenes in Arkansaw*, 1858.

Thorpe, THOMAS EDWARD, F.R.S., b.1845. English writer on chemistry; prof. at Glasgow, Leeds, and London. *Dict. Applied Chemistry*, 1890–93.

Thorpe, WILLIAM, d. after 1430. English Lollard, imprisoned 1407; celebrated in Foxe's *Book of Martyrs*.

Thorvald. Norse seaman, brother of Leif; said to have visited New England 1002, and been killed by natives 1004.

Thorwaldsen, BERTEL, 1770–1844. Danish sculptor of great fame, at Rome from 1796, except 1819–20, 1838–41, and 1844. Among his most familiar works are *Night*, *Morning*, *Mercury* and *Adonis*. His subjects were mostly classical.

A Blessing Christ, by Thorwaldsen.

Thorwaldsen Museum. At Copenhagen; founded by bequest of the sculptor to exhibit his own works.

Thoth. Egyptian deity, corresponding with Hermes; inventor and patron of letters; guide of departed souls; secretary of the gods.

Thothmes I. Fourth king of 18th Egyptian dynasty; conqueror of Ethiopia.—II. and III., his sons; the latter conquered Syria.—IV. Eighth king of 18th dynasty.

Thott, BRIGITTE, 1610–1662. Danish translator of Seneca and Epictetus.

Thou (THUANUS), JACQUES AUGUSTE DE, 1553–1617. French historian of high rank. His work is in Latin and of great length; it extends from 1543 to 1607, appeared 1604–19, and was tr. 1773. He was of the Moderate party, and in favor with Henry IV.

Thought. Active, voluntary, synthetic mental process, based upon data of perception, memory, and imagination; highest form of mental activity, and controlling principle of mental life. It deals with ideas and their relations, not with the particular objects of sense. There are three stages, CONCEPT, JUDGMENT, and REASON (q.v.).

Thought Reading. See MIND READING and TELEPATHY.

Thought Transference. See MIND READING and TELEPATHY.

Thousand and One Nights. See ARABIAN NIGHTS ENTERTAINMENT.

Thousand Islands. In the St. Lawrence, n.e. of Lake Ontario; ab.1,800; sites of many villas and hotels.

Thrace. Region limited by the Danube, the Euxine, the Ægean Sea, and the Strymon; inhabited by various savage and warlike tribes; said to have been conquered by Sesostris, king of Egypt, and by the Persian Megabazus 510 B.C.; from ab.490 B.C. independent, and for a time united under one king; conquered, most of it, by Philip of Macedon. The Roman province was s. of the Hæmus Mts. and e. of the Nestus.

Thrale, H. L. See PIOZZI.

Thrasimeno. See TRASIMENO.

Thrasybulus, d.389 B.C. Athenian general, banished 411; overthrower of the 30 Tyrants 403; commander at sea 391 B.C.; accused of treason; slain in s. Asia Minor.

Thread. Fine linen, cotton or silk yarn, made thicker than for weaving. In factory language thread always means two or more yarns twisted one around another, the yarns being doubled or trebled and then twisted around each other in a direction contrary to the twist of the yarn. It is sometimes bleached or dyed. The stronger kind of silk thread is called twist.

Thread-Cells. See NETTLE CELLS.

Thread-Worms. See NEMATODA.

Threats. To constitute an actionable private wrong, words of menace or intimidation must result in actual damages to another. Without such result, they may constitute a crime, or subject the utterer to being bound to keep the peace.

Three Chapters. Writings of Theodore of Mopsuestia, Theodoret and Ibas; condemned 544 by an edict of Justinian, which caused a fierce controversy, being repudiated in the West, though accepted in the East and by the Pope.

Three Estates. See TIERS ÉTAT.

Three Kings, FEAST OF THE. Mediæval festival, identical with Twelfth Night or Epiphany.

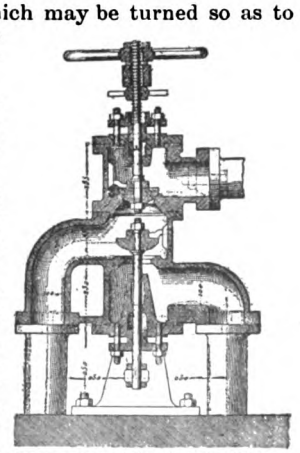
Three-Nerved. With three principal veins running longitudinally through the leaf.

Three-Ranked. Arranged in three vertical rows on the stem, as the leaves of *Cyperaceæ*.

Three Rivers. Town of Canada, on the St. Lawrence, at the mouth of the St. Maurice, 77 m. w.s.w. from Quebec; founded 1634; scene of an American defeat June 16, 1776. Pop., 1891, 8,334.

Three-Valved. Splitting into three portions at dehiscence.

Three-way Valve. One which may be turned so as to connect a pipe with either of two other pipes, or be shut off altogether.



Three-way Valve for the lifting bridge at La Villette.

Thremmatology. Science which treats of heredity and variation, the production of races and breeds; stirpiculture.

Threshing. Separation of grain or seeds of plants from the straw was accomplished in ancient times by beating with sticks or by the flail, consisting of two sticks, loosely tied together at one end; the ancient Egyptians freed the grain by driving cattle over the loosened sheaves. The first practical machine was invented by Andrew Meikie, a Scotchman, in 1787. The grain was separated by beaters attached to a revolving drum. Since 1840 the machines have been much improved in the U. S. A skeleton iron cylinder, provided with teeth, revolves in a cast-iron cylinder, provided with slots, through which the grain escapes, the straw being finally cleaned by a shaker and air blast. Another machine has an externally toothed cylinder

revolving in a cylinder provided internally with teeth. The machines are driven by horse or steam power.

Thrift. *Armeria vulgaris.* Maritime herb of the natural order *Plumbaginaceæ*, native of cooler parts of n. hemisphere.

Thring, EDWARD, 1821-1887. Headmaster from 1853 of Uppingham School, Eng., where his success was eminent.—His brother, GODFREY, b.1823, Prebendary of Wells 1876, is a well-known hymnist. *Ch. of England Hymn-book*, 1880–82.

Thrips. See PHYSOPODA.

Throat. In Botany, opening of the tube of a calyx or corolla.

Throat Diseases. Diseases invading the throat are those which attack its mucous membrane, forming varieties of catarrhal affections whose special names depend upon the location and special manifestations of the malady. Or they are diseases affecting special organs located in the parts included by the term. An example of latter class is TONSILLITIS (q.v.). The catarrhs are named from the seat of the disease, as pharyngitis, when it is an inflammation of the mucous membrane of the pharynx: laryngitis, when of the larynx, etc. They may be acute or chronic. Clergyman's and Costermonger's sore throat are familiar examples of a chronic pharyngitis. See DIPHTHERIA and QUINSY.

Throckmorton, JAMES WEBB, 1825–1894. Gov. of Texas 1866–67; M.C. 1875–79 and 1883–87.

Throgmorton, SIR NICHOLAS, 1513–1571. English envoy to Scotland and France; imprisoned 1569.

Thrombosis. Derangement of the circulatory apparatus causing coagulation of some of the contained blood. It may be simply pressure on a blood-vessel, or an inflammation of a vein. The symptoms are more frequently observed in the veins, where the resulting clot may be large enough to prevent the flow of blood through the vessel. This condition is sometimes sought, as in the operation of ligation for hemorrhoids. Frequently a part of a clot or a smaller clot is washed away and carried to another part of the body, eventually plugging the lumen of another blood-vessel. This migrating thrombus is called an embolus, and the resulting disease EMBOLISM (q.v.).

Throop, ENOS THOMPSON, 1784–1874. Gov. of N. Y. 1829–32.—His nephew, MONTGOMERY HUNT, b.1827, pub. *Revised Statutes of N. Y.*, 1878, and *Code of Civil Procedure*, 1880.

Throw. Amount of vertical displacement when rocks are faulted.

Throw of Switch. Distance the movable rail of a switch can be displaced horizontally by reversing the lever.

Thrush. One of the inflammatory diseases of the mouth, characterized by the appearance of a number of small, whitish points, afterward coalescing forming patches that resemble curd-like masses. These may eventually turn brown. It is a disease of childhood and lasts from two to three weeks, usually accompanied by some constitutional disturbances. It is due to the presence of a fungus, whence its scientific name, mycotic stomatitis. The precise species is not determined, but it is, probably, the oidium albicans. It is not dangerous unless the patient be otherwise much debilitated.

Thrush. Some members of genus *Seiurus*, of family *Mniotiltidæ*. The "wood-warblers" are known as Thrushes, *e.g.*, the Water Thrush and the Golden Crowned Thrush; but true Thrushes include the family *Turdidæ*, universally distributed; being found even on oceanic islands. They are most numerous in the Old World, including Old-World Warblers, Tailor-birds, Nightingales, the Ring Ouzel, Mistletoe Thrush, etc. In England the Song Thrush is famed as the rival of the Nightingale. In America the Thrushes are related to the Flycatchers and Blue-birds. The American Robin (Red-breast) is a member of the Thrush family, as is also the Oregon Robin. See DENTIROSTRES, WILSON'S THRUSH, and WOOD THRUSH.

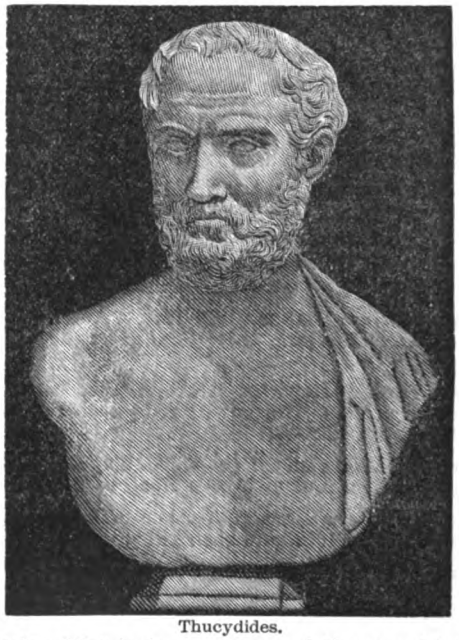
Missel Thrush (*Turdus viscivorus*).

Thrust. 1. Outward push of a rafter or arch against a wall or abutment. It increases as the rise of the rafter or arch decreases. 2. In Mining, movement in the floor of a mine, caused by weight of overlying rock; practically synonymous with CREEP (q.v.).

Thrust-Bearing. Form of bearing for the last length of a propeller shaft close to the stern of a steamship, by which the reaction of the water against the wheel is received and transmitted to the hull for its forward motion; whatever work is necessary to drive the engine forward is in action at this point. It is a box-bearing (see BEARING) in which a number of square grooves are bored out to be the complements of similar rings or collars formed upon the shaft. The sides of the rings bear upon the sides of the grooves, and take the thrust of the screw. The grooves are faced and lined with Babbitt metal, and waterpipes can force circulating water in cored cavities around the bearing to keep it cool. Such bearings will be 4 ft. long for a 14 in. shaft.

Thrust Plane. Almost horizontal plane of movement, along which strata have been driven by tangential pressure developed in the crust of the earth. In some cases the upper strata have been thrust forward for miles over those that underlie them, as in the Highlands of Scotland.

Thucydides, ab.471–401 B.C. First of critical and philosophic historians; Athenian, in Thrace from 424 B.C. His *Hist. Peloponnesian War* is in every way of the very highest rank and value.



Thucydides.

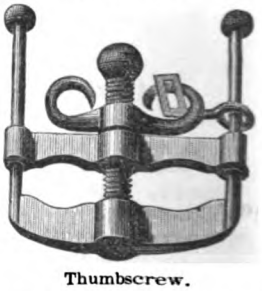
Thugs. Secret confederacy of professional assassins which infested India from ab. 13th century till stamped out 1828–35. They traveled in gangs of 10 to 200, strangling and plundering wealthy wayfarers, as a religious duty owed to the goddess Devi or Kali. They had a jargon of their own, and signs by which to recognize one another. See THIEVES' JARGON.

Thule. Island alleged to have been visited by Pytheas of Massilia 4th cent. B.C.; six days' sail n. of Britain, with day and night each six months long; variously conjectured to be Iceland, the Shetland Islands, and Lapland. "Ultima Thule" is a synonym for any remote or unattainable goal.

Thulite. Rose-red variety of the mineral ZOISITE (q.v.), found in Norway.

Thulium. Tm. At. wt. 170.7, valence III. Element discovered by Cleve, 1879, in gadolinite. Its homogeneity is not established. Its oxide is white, Tm_2O_3.

Thumbscrew. Implement of torture, employed especially in Spain by the Inquisition, and in Scotland upon the Covenanters; last used 1682.



Thumbscrew.

Thümen, FELIX. FREIHERR VON, 1839–1892. German mycologist. *Fungi Austriaci*, 1871–75; *Mycotheca Universalis*, 1875–84.

Thummim. Worn with Urim by Jewish High Priests when they solicited the Divine oracles; compared to the sapphire image of Truth worn by the Chief Judge of Thebes, in Egypt.

Thun, LAKE. In Switzerland, above the town of Thun. Interlaken is on its e. shore. Length 10½ m., width 2½ m., depth 710 ft., altitude 1,837 ft.

Thunberg, CARL PETER, 1743–1822. Prof. of Botany in Upsala 1781. *Resa uti Europa, Africa, Asia*, 1770–79; *Flora Japonica*, 1784; *Flora Capensis*, 1807–13.

Thunder. See LIGHTNING.

Thunder Bay. In Canada, the inlet at the head of Lake Superior on which Port Arthur stands.

Thunder-Clap. Specially intense, loud, short roll of thunder.

Thundering Legion. Mythical body of Christians serving in the war against the Quadi, 174, whose prayers for rain, when the army was in great straits, were answered by a storm which destroyed numbers of the enemy by hail and lightning, and secured a Roman victory.

Thunder Storms. Brief local rain storms, with much thunder, lightning and wind, frequently changing to hail, and occurring in warm weather. They are very frequent in tropical regions, but rarely occur in temperate zones in winter.

Thunen, JOHANN HEINRICH VON, 1783–1850. German economist, noted for his practical experiments in agriculture and in profit-sharing at Tellow in Mecklenburg. *Der Isolierte Staat in Beziehung auf Landwirthschaft und Nationalökonomie,* 1826–63.

Thurible. See CENSER.

Thurifer. In R. C. services, acolyte who attends the priest, carrying the thurible or censer.

Thuringerwald. See THURINGIA.

Thuringia. Saxon region between the Werra and the Saale, s. of the Harz Mts. Its forest, Thuringerwald, is a range ab. 60 m. long, and reaches a height of 3,460 ft.

Thurlow, EDWARD, BARON, 1732–1806. M.P. 1768; Solicitor-gen. 1770, Atty.-gen. 1771; Lord Chancellor 1778–92, except part of 1783; Tory, of low character and offensive manners.

Thurman, ALLEN GRANBERY, 1813–1895. M.C. from Ohio 1845–47; Judge of Ohio Supreme Court 1851; Chief-justice 1854–56; U. S. Senator 1869–81; Chairman of Judiciary Committee; Democratic candidate for Vice-President 1888. The "Thurman Act" was designed to compel the Pacific railways to fulfill their obligations to the U. S.

Thurneysen, EDUARD RUDOLF, b.1857. Swiss philologist, prof. Jena 1882 and Freiburg 1887.

Thurn und Taxis. German family of Italian origin, princes since 1698; founders of posts from 1460; monopolists of mails in the empire from 1595 till recent times.

Thurot, FRANÇOIS, 1726–1760. French privateer, commander of a squadron 1755 and 1759; killed near Belfast.

Thursby, EMMA CECILIA, b.1857. American soprano singer, known since 1875.

Thursday. Fifth day of the week, named from THOR (q.v.). Thursday is in Latin dies Jovis, or Jupiter's day.

Thurston, ROBERT HENRY, b.1839. Prof. U. S. Naval Academy 1875, Stevens Institute 1871, and Cornell 1885; engineer and inventor. *Materials of Engineering,* 1882–86; *Steam Engine,* 1890–91.

Thusnelda. Daughter of Segestes, and wife of Hermann or Arminius; made prisoner by Germanicus 15, and led in triumph at Rome.

Thwaites, REUBEN GOLD, b.1853. American antiquarian. *Historic Waterways,* 1888.

Thyestes. Son of Pelops; his brother Atreus killed and served up his two sons at a banquet for him, for which the gods cursed Atreus and his house.

Thyine Wood. Mentioned in the Bible, and is probably SANDARACH (q.v.) wood. The Turks floor their mosques with it, believing it to be indestructible.

Thylacoleo. Large, extinct, probably carnivorous, Marsupial, with a broad trenchant premolar.

Thyme. *Thymus vulgaris.* Low aromatic shrub, native of s. Europe; cultivated in gardens. The Wild Thyme is *T. serpyllum,* a native of Europe, sparingly naturalized in N. America.

Thyme (*Thymus serpyllum*).

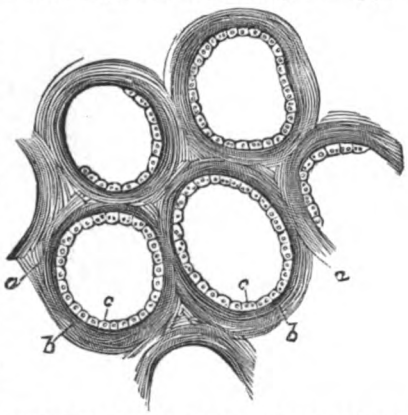
Thyme, OIL OF. Volatile oil obtained from *Thymus vulgaris* and *T. serpyllum,* of agreeable, strong and penetrating odor, and much used in Europe in culinary seasoning.

Thymelæaceæ. Natural family of flowering plants, of the class *Angiospermæ,* subclass *Dicotyledons,* and series *Apetalæ,* comprising 38 genera and ab. 400 species, distributed through the temperate and warm regions and the tropics of the whole earth; called the Mezereum family.

Thymol. C_6H_3,CH_3,C_3H_7,OH. Mpt. 50° C.; phenol, derived from methylpropylbenzene; prepared from oil of thyme; crystalline solid, with a strong but pleasant odor; used as an antiseptic and disinfectant.

Thymus Gland. Temporary, ductless gland, attaining its full size at the end of the second year, after which it dwindles away. It is located in the chest cavity behind the sternum. It has an uncertain function. In the calf it forms the true sweetbread. It has been claimed that an extract of the thymus gland was curative in cases of exophthalmic goitre, but the results of other observers do not substantiate this claim.

Thyroid Gland. Ductless gland surrounding the upper end of the windpipe in front. Its function is obscure and under discussion. It is of general interest, as the enlargement of the gland causes the condition known as GOITRE (q.v.). That form of imbecility known as CRETINISM (q.v.) is associated with a congenital absence of the gland: while a somewhat analogous disease of adult life, myxedema, follows the surgical removal of the gland or is accompanied by its atrophy. The exhibition of sheep's thyroids or of the extracts of thyroid glands has brought about a cure of this otherwise incurable disease in a number of instances. Thyroid extract also reduces flesh when administered for some time.


Group of Gland-vesicles from the Thyroid Gland of a Child:
a, connective tissue; *b*, membrane of the vesicles; *c*, epithelial cells.

Thyrsus. Compound kind of inflorescence, with the primary branching racemose and the ultimate branching cymose.

Thysanoptera. See PHYSOPODA.

Thysanura (including COLLEMBOLA). Wingless *Insecta,* having the body covered with hairs or metallic scales, and having rudimentary mouth parts. The abdomen terminates in setæ, which may serve as a springing apparatus. The development is without metamorphosis. Some forms like the *Campodidæ* have rudimentary legs on the abdomen. The *Poduridæ* or Spring-tails belong in this group. The group is considered as representing degenerated *Neuroptera.*

Tiara. Papal miter, surrounded with three crowns; used chiefly for state, as the Golden Miter for special solemnity.

Tibbu. People of the Sahara.

Tiber. River famous in Roman history. It rises in the Apennines, and flows 260 m. s. to the Mediterranean at Ostia.

Tiberias. Palestinian city, on w. shore of Gennesaret. After the fall of Jerusalem, it was for several centuries the western metropolis of Judaism, and a seat of Jewish learning. Saladin defeated the Crusaders here 1187.

Tiberias, SEA OF. See GENNESARET.

Tiberias (CLAUDIUS NERO), 42 B.C.–37. Stepson and son-in-law of Augustus; heir to the throne 4; Emperor 14. He ruled well at first, but later became a morose and gloomy tyrant, living in retirement at Capreæ from 26, debauched and perhaps insane. Tacitus' account of him may be overdrawn, and the facts are imperfectly known; but the murder of GERMANICUS (q.v.) and many other crimes are popularly credited to him. The chief events of the Gospel narrative occurred during his reign: his denarius is called "tribute-money."

Tibet. Region of central Asia. It constitutes a plateau, the highest of great extent upon the globe, having an estimated area of ab. 650,000 sq. m. and a mean altitude of probably 15,000 ft. It is bordered on the s. by the Himalayas, on the n. by the Kuenlun and Nushan Mts., and is intersected by other ranges. It is mainly desert, with little arborescent vegetation. The climate is very severe, and the country imperfectly known. It was conquered ab.1720 by China, and is still nominally subject. Capital Lhasa; pop. variously estimated, probably ab. 5,000,000.

Tibetan. Monosyllabic language of Asia, simple in grammatical structure, the words strongly consonantal. It has a considerable literature, derived mainly from Sanskrit sources.

Tibetans. Turanians of Tibet, more or less admixed with surrounding tribes. They have Chinese features, but are taller. Like some other tribes, they claim descent from an ape, who

lost his tail by eating a special heaven-sent grain. The religion is Lamaism, a modified Buddhism, introduced ab.639.

Tibetans.

In some parts half the population are priests. Woman holds a high place. All the land belongs to the priests.

Tibet Dog. See MASTIFF.

Tibio-Tarsus. Upper leg (crus) of birds, formed by the union of the tibia with the proximal tarsal bones; separated from the pelvis by the more or less concealed femur (thigh bone), and from the toes by the scaly TARSO-METATARSUS (q.v.).

Tibullus, ALBIUS, ab.54–19 B.C. Latin elegiac poet from whom we have many love songs of great tenderness and beauty. The third and fourth books which bear his name are probably not his.

Tic Douloureux. Name given to facial neuralgia in its violent form. Certain parts of the face may be attacked, as the neighborhood of the eye, the cheek with the lips, a portion of the jaw, apparently following the distribution of one of the branches of the trifacial nerve. At other times the pain shoots from one region to another, as if the source of irritation were in the nerve trunk.

Tichborne Case. Tried in London 1871-72. Arthur Orton, alias Thomas Castro, a butcher from Australia, claimed large estates in Hampshire, personating an heir, Roger Charles Tichborne, b.1829, who had died at sea 1854, and whose mother he had deceived. He was non-suited March 6, 1872, and after another long trial convicted of perjury Feb. 28, 1874, and imprisoned for 14 years. The two trials lasted 103 and 188 days, and cost some £90,000. The claimant confessed his imposture 1895.

Tichenor, ISAAC, LL.D., 1754–1838. Judge of Vt. Supreme Court 1791, Chief-justice 1795–96; U. S. Senator 1796–97 and 1815–21; Gov. of Vt. 1797–1807 and 1808–9.

Ticino, or TESSIN. S.e. canton of Switzerland; mostly Italian and R.C. Area 1,082 sq. m., pop. ab. 130,000.

Ticinus (now TESSINO). River in Cisalpine Gaul, on the bank of which Hannibal gained his first victory over the Romans, 218 B.C.

Tickell, THOMAS, 1686–1740. English poet, author of the ballad *Colin and Lucy*, and an elegy on Addison 1721. *Kensington Gardens*, 1722.

Ticket of Leave. In England, since 1840, abridgment of a convict's term: previously, in Australia, partial liberty; in either case, the reward of good conduct in prison.

Tickets. See TRAVELERS, RIGHTS OF.

Ticknor, GEORGE, 1791–1871. Prof. Harvard 1820–35. His *Hist. of Spanish Literature*, 1849, is highly valued. *Life of Prescott*, 1864.

Ticknor, WILLIAM DAVIS, 1810–1864. Publisher in Boston from 1832; head of a firm of high literary repute.

Ticks. See IXODIDÆ.

Tickseed. See COREOPSIS.

Tickseed-Sunflower. *Coreopsis trichosperma.* Yellow-flowered swamp herb of the Composite family, native of the e. U. S.

Tick-Trefoil. Herbs of the genus *Meibomia*, natural family *Leguminosæ*, natives of America, bearing small purple flowers and jointed prickly pods.

Ticonderoga. French fort, in Essex co., N. Y., on Lake Champlain; built 1755; taken by the British 1759, by Ethan Allen May 10, 1775, and by Gen. Burgoyne July 5, 1777, and

Ticonderoga.

again by the British 1780; dismantled at the close of the war, and now a picturesque ruin. The township has graphite and iron mines. Pop., 1890, 3,980.

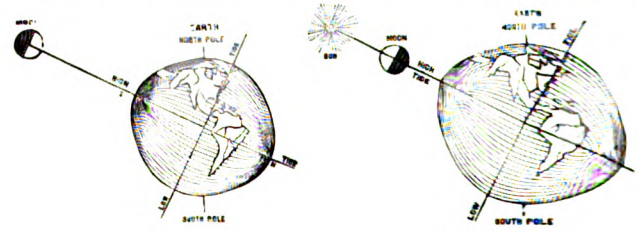
Tidal Evolution. Gradual changes produced in the motions of two bodies composed wholly or in part of fluid, by the mutual tidal action upon each other. G. H. Darwin has shown that this has probably been a powerful factor in the evolution of the earth and moon.

Tidal Showers. Rains (apparently) brought up by the tide, either along the coast or up tidal rivers.

Tidball, JOHN CALDWELL, U.S.A., b.1825. Artillery officer, in Va. 1861–65; Col. 1885. *Heavy Artillery Service*, 1880.

Tiddledy Winks. Modern game in which small bone disks are made to spring into a basket or receptacle placed in the center of the board, by pressing them forcibly with a slip of bone upon their edge. An analogous game, of flipping small shells into a hole in the ground, is played by children in Siam and the Liu Kiu islands.

Tides. Periodic rise and fall of the waters of the ocean, twice every 24 h. 57 m. on the average; caused by the attraction of the moon, and to a smaller extent by that of the sun. When they act together, either in the same or opposite directions, as at new and full moon, the effect is greatest, and is known as Spring Tide. When they act at right angles to one



Lunar Tide. Luni-Solar Tide.

another, *i.e.*, when the moon is in its 1st or 3d quarter, the effect is least; Neap Tide. The tidal wave is never under the moon, but, owing to friction and the resistance of land masses, lags behind. The height of the tide in the open sea is small, being in the Pacific but 2 ft.; in gradually narrowing bays it rises to a great height. See FUNDY, BAY OF.

Tide Wheel. Form of water motor to utilize the current inshore on the rise of tide, and outward upon the ebb. It has two forms: (1) a simple current wheel, supported on an anchored float and turned by the alternating flow through a channel which connects an arm of the sea with an inner basin; (2) an intermittent type, involving reservoirs behind dykes which are filled with the rise of the tide. When the tide recedes, gates in the dyke are closed, and gates to the wheel allow the water to fall through the wheel and turn it on the way to the lower level. Current wheels of the first type utilize ab. 40 per cent of the theoretical efficiency, and of the latter type from 50 to 60 per cent.

Tie-Beam. Wooden lower chord of a roof truss or bridge truss; any wooden beam under a tensile stress.

Tiebout, CORNELIUS, 1777–ab.1830. American engraver, especially of portraits of public men.

Tieck, LUDWIG, 1773–1853. German poet, critic, novelist, and translator, long popular in his renderings of fairy tales and old traditions; leading romanticist.

Tiele, CORNELIS PETRUS, b.1830. Prof. Leyden 1877. *Egyptian Religion*, 1869, tr. 1882; *History of Religion*, 1876, tr. 1878.

Tiemannite. HgSe. Rare mineral compound of mercury and selenium, found in the Harz Mts. and a few other localities.

Tien-Shan, or THIAN-SHAN. Mountain range of Turkestan, n. of Kashgar; partial s.e. boundary of Russian territory. Length ab. 1,000 m.; greatest ht. 24,000 ft., average ab. 11,000.

Tientsin. City and port of China, the junction of the Yunling and Peiho Rivers; open to foreigners since 1863. It has a large commerce. Pop. ab. 950,000.

Tiepolo, GIOVANNI BATTISTA, 1696–1770. Venetian painter, who revived to some extent the color of his predecessors. He

The Holy Jacobus, by Tiepolo.

was chiefly known as a wall painter; his easel pictures have great merit.—His son, DOMENICO, ab.1726–1804, was also a painter.

Tiernan, MRS. FRANCES C. (FISHER), ("CHRISTIAN REID"), m.1887. American novelist. *Valerie Aylmer*, 1870; *Hearts of Steel*, 1882; *Las Cruces*, 1895.

Tierney, GEORGE, 1761–1830. M.P. 1789; Whig leader; Sec. for Ireland 1806. *East India Co.*, 1787.

Tie-Rod. Used to counteract the thrust of a rafter; any rod subject to tension. Such rods are frequently furnished with sleeve nuts or turnbuckles, so that they may be screwed up to stiffen the structure.

Tierra del Fuego. Large barren island, with many smaller ones, at s. extremity of S. America; separated from the continent by the Straits of Magellan; held by Argentina and Chili. Area ab. 21,000 sq. m., pop. ab. 8,000, savages. See FUEGIANS.

Tierra Firme. See TERRA FIRMA and SPANISH MAIN.

Tiers Etat. In France, the nobility and clergy formed, before the Revolution, the two privileged classes. The Third Estate comprised the rest of the nation, or rather the burghers, who could send representatives to the STATES-GENERAL (q.v.).

Tie-Strut. Bar subject to both tension and compression under different positions of the applied forces. It must be larger in cross-section than a bar subject only to one kind of stress.

Tietjens. See TITIENS.

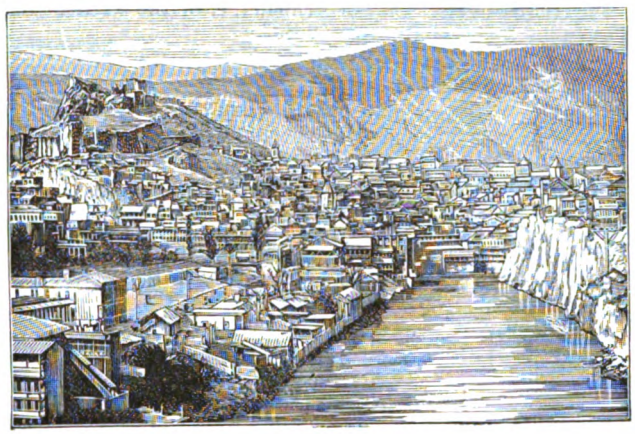
Tiffany, CHARLES C., D.D., b.ab.1838. Archdeacon of New York. *Hist. P. E. Ch.*, 1895.

Tiffany, LOUIS COMFORT, b.1848, N.A. 1874. American painter, decorator, and artist in stained glass and mosaic. He has made important discoveries and improvements in this art.—His father, CHARLES LOUIS, b.1812; founder and head of a famous firm of jewelers in New York.

Tiffin. Capital of Seneca co., Ohio; on the Sandusky; seat of Heidelberg Univ. Pop., 1890, 10,801.

Tiffin, EDWARD, M.D., 1766–1829. Gov. of Ohio 1803–7; U. S. Senator 1807–9.

Tiflis. City of the Caucasus, Asiatic Russia, on the Kur, in a picturesque depression surrounded on all sides, except the n., by high mts.; annexed to Russia 1802; celebrated for its hot



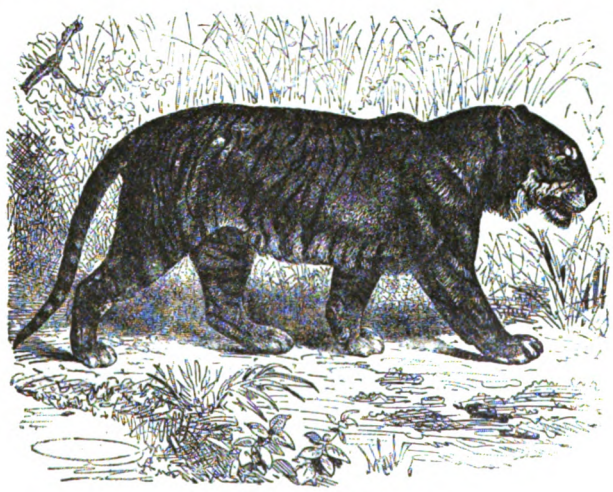
Tiflis.

springs and metal work. It was for many centuries the stronghold of Eastern Christianity, against the Persians first, and later against the Moslems. A bridge across the Kur is 1,350 ft. high. Pop., 1883, 104,024; 1892, 146,792.

Tiger-Beetle. See CINCINDELIDÆ.

Tiger Eye, or TIGER STONE. See CROCIDOLITE.

Tigers. Largest and fiercest of the cats. They differ from the lion in lacking a mane and a tail-tuft, but have side whiskers. The coat is marked with dark vertical stripes on a tawny ground. The pupils are round. In the Royal Indian Tiger a length of 11 ft. is attained. Tigers range from Siberia to Java, and from Burmah to w. Asia. In India they are most



Tiger (*Felis tigris*).

common: one will destroy 60 head of cattle a year; they attack man and will devour their own species. They kill their prey by dislocating the neck with a bite. The JAGUAR (q.v.) is sometimes called the American or Clouded Tiger. The Arboreal Tiger, *Felis macrocelis* of s.e. Asia, attains a length of 4 ft. In Tibet is a Tiger Cat 2 ft. long, and in s.e. Asia is the Marbled Tiger Cat with a linear pupil. 546 people were killed by tigers in Central India 1886–89. See FELIDÆ.

Tighe, MARY (BLACHFORD), 1773–1810. Irish poet. *Psyche*, 1805. *Works*, 1811.

Tight Lacing. Device of fashion to transform the human form from the harmonious lines of a Venus de' Medici to the monstrosity exhibited in a Parisian fashion plate. Tight lacing produces a deformity of the trunk comparable to the results of foot-binding among the Chinese. The cavity of the chest is contracted and the contents of the abdominal cavity are displaced downward, crowding upon the organs in the pelvis, resulting in discomfort and disease.

Tiglath-Pileser III. King of Assyria ab.746–740 B.C.; mentioned II. Kings xv. as assisting Ahaz of Judah against Israel and Syria; conqueror of Damascus and Tyre. His inscriptions were mutilated by Sargon.

Tigranes II., THE GREAT, d.55 B.C. King of Armenia 96; master of all Syria to the Euphrates 83; conquered by Lucullus 69, and by Pompey 66.

Tigranocerta. City of Armenia, e. of the Tigris. Near it Lucullus defeated Tigranes 69 B.C.

Tigri, GIUSEPPE, 1806–1882. Italian author; compiler of Tuscan folk-songs, 1856.

Tigris. Left branch of the Euphrates, which it joins ab. 100 m. from the Persian Gulf, after a s.e. course of ab. 1,100 m. from w. Kurdistan. It is navigable to Ophir, 50 m. n. of Bagdad, by vessels having 4 ft. draught.

Tilden, SAMUEL JONES, 1814–1886. American lawyer and statesman; active in the struggle with the Tweed Ring; Gov. of N. Y. 1874–76; Democratic candidate for Pres. in 1876, receiving 250,960 more votes than Hayes, and 184 uncontested electoral votes, but one more being necessary for election. The case was decided against him by the ELECTORAL COMMISSION (q.v.). He bequeathed the bulk of his property to found a free library in New York City. The will was contested and decided in favor of the heirs, but one of them relinquished over $2,000,000 to carry out his intent. In 1895 the Astor Library, Lenox Library and Tilden Trust Fund were consolidated as the New York Public Library.

Tiles. Hard-burned clay pipes, used in making underground drains. They are of two main forms, round and horseshoe, the latter usually being laid upon boards. The use of tiles in this way for draining land has long been practiced.

Tiles. 1. Thin plates of baked clay used to cover roofs. The Romans had flat tiles, turned up at the edges, with inverted semi-cylindrical tiles to cover the joints. In England curved tiles are used, each tile overlapping the next; plain tiles are also used. Fireplaces are sometimes lined with tiles. 2. Glazed decorative tiles were used in ancient times for paving sacred edifices. Encaustic tiles were used in the Middle Ages for pavements and wall decoration; for these, squares of clay 4–6 in. sq. and 1 in. thick were impressed by a stamp, with a design in relief. Into the hollows thus made colored clays were inlaid, a metallic glaze applied and the tile baked in a furnace. At present the hollows are filled with semi-liquid slips of clay and water.

Tilghman, MATTHEW, 1718–1790. "Patriarch of Md."; delegate to Congress 1775–77; pres. Md. Constitutional Convention 1776.—His brother, JAMES, 1716–1793, sec. Pa. Land Office 1765–75, was regarded as a loyalist.—His son, WILLIAM, 1756–1827, became Chief-justice of Pa. 1806.—His brother, TENCH, 1744–1786, was sec. and aid to Washington 1776–82.

Tilgner, VICTOR OSCAR, 1842–1896. Austrian sculptor.

Tiliaceæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 51 genera and ab. 470 species, widely distributed throughout all parts of the earth; called the Linden family.

Till. Thick deposit of commingled clay, sand, gravel, and bowlders, more or less firmly compacted together, often by the grinding and pressure of ice.

Tillemont, LOUIS SÉBASTIEN LE NAIN DE, 1637–1698. French Jansenist; ch. historian of the first six centuries. *Hist. des Empereurs et des Persecutions*, 6 vols., 1691–1738; *Mémoires pour servir à l'Histoire ecclésiastique*, 16 vols., 1694–1712.

Tiller. Beam attached to the head of the rudder, which is turned by it.

Tilley, SIR SAMUEL LEONARD, LL.D., 1818–1896. Lieut.-gov. of New Brunswick 1873–78 and 1885; Canadian Minister of Finance 1873 and 1878–85; knighted 1879.

Tillinghast, THOMAS, 1742–1821. Judge of R. I. Supreme Court 1780–87 and 1791–97; M.C. 1797–99 and 1801–3.

Tillman, BENJAMIN RYAN, b.1847. Gov. of S. C. 1890–94; U. S. Senator since 1895.

Tillman, SAMUEL DYER, 1815–1875. Prof. American Institute, New York; inventor of the revolving planisphere and musical scale or tonometer.

Tillman, SAMUEL ESCUE, U.S.A., b.1847. Prof. West Point from 1880. *Heat; Chemistry.*

Tillodonta. Suborder of *Bunotheria*, including Eocene Mammals with affinities to the *Rodentia*, in having incisors faced with enamel and growing from persistent pulps. In other respects they resemble the *Insectivora*. The canines are small. The molars are like those of Ungulates in their crowns, but in some cases grow from persistent pulps. The feet are plantigrade, pentadactyl, and unguiculate, as in bears.

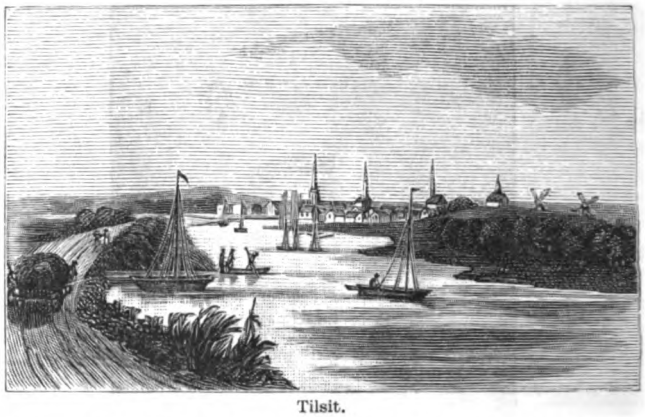
Tillotson, JOHN, D.D., 1630–1694. Dean of Canterbury 1672; Dean of St. Paul's 1689; Abp. of Canterbury 1691. His sermons, pub. posthumously in 14 vols., were very popular, and are still models of style.

Tillson, DAVIS, b.1830. Brig.-gen. U. S. Vols. 1863–66, holding artillery commands, chiefly in the West.

Tilly, JOHANN TSERKLAES, GRAF VON, 1559–1632. Imperial general in the 30 Years' War; victor in 36 battles; Wallenstein's successor 1630; notorious for the pillage and slaughter at Magdeburg, May 1631; defeated at Breitenfeld Sept. 17, 1631; mortally wounded at the Lech, Bavaria.

Tilopteridaceæ. Order of filamentous brown *Algæ*.

Tilsit. Town of e. Prussia, on the Niemen. A treaty concluded here between Napoleon and the Czar, July 1807, bestowed on Jerome Bonaparte, as King of Westphalia, the Prussian do-



Tilsit.

minions between the Elbe and the Rhine; erected Prussian Poland into an independent Grandduchy of Warsaw, assigning it to the Elector of Saxony; closed the Prussian harbors to British trade, and reduced the Prussian army to 42,000. Pop., 1890, 24,545.

Tilth. Finely divided and loose condition of surface soil, brought about by continued use of plow, harrow, and cultivator, to fit it for the reception of seed.

Tilton, JAMES, M.D., 1745–1822. Surgeon in American armies 1776–82; in Congress 1783–85; Surgeon-gen. 1812–15. *Military Hospitals*, 1813.

Tilton, JOHN ROLLIN, 1833–1888. American landscape painter, working in Italy.

Tilton, THEODORE, b.1835. Ed. N. Y. *Independent* 1863–72, and *Golden Age* 1872–74; accuser of H. W. Beecher, and plaintiff in a famous trial, 1874, in which the jury disagreed; in Europe since 1883; author of many poems, and of a romance, *Tempest-tossed*, 1875.

Timæus, ab.352–256 B.C. Greek historian of Sicily. Fragments of his work remain.

Timanthes, ab.400 B.C. Greek painter, whose *Sacrifice of Iphigenia* was much praised.

Timber. U. S. forest area is 495,000,000 acres, 26 per cent of the total area. The white pine of the Northwest and New England is practically exhausted; of the long-leaf pine of the South there remains 1,500,000,000 cu. ft. The first to be exhausted will be the ash, followed by the tulip and walnut. Forest fires destroy annually $12,000,000 worth. See FORESTRY.

Timber, STRENGTH OF. As average values, 8,000 lbs. per sq. in. in compression and 10,000 in tension may be stated for the ultimate strength, but much variation exists in different varieties and qualities. The shearing strength across the

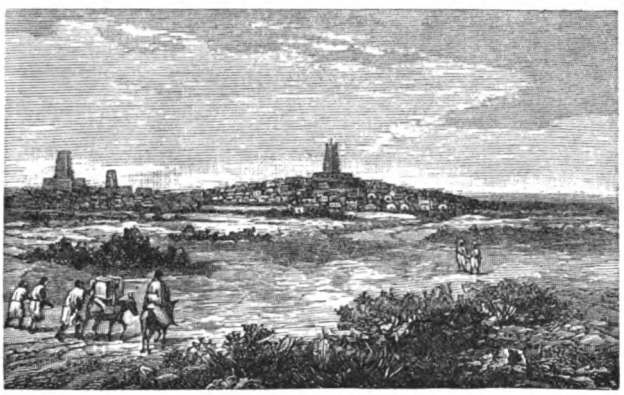
grain is ab. 3,000 lbs. per sq. in., while parallel with the grain it is only ab. 500.

Timber-Line. Limit in altitude of growth of trees on high mountains.

Timbre. Peculiar property of sound depending upon the number of overtones given out by the sonorous body; distinguishing feature of musical instruments and of human voices. On differences of timbre depend the characteristic sounds of bodies of different material and structure. See OVERTONES and QUALITY.

Timbrel. Small ancient musical instrument carried in the hand and similar to the modern tambourine. It was used by Miriam after the passage of the Red Sea.

Timbuctoo. Town of w. Africa, between the Sahara and the Niger, in lat. 16° 49′ N.; probably founded ab. 1100, visited



Timbuctoo.

by Ibn Batuta ab. 1350, and by Laing 1826; commercially important. Pop. perhaps 20,000, of mixed races.

Timby, THEODORE RUGGLES, Sc.D., b.1822. American inventor of the turbine water-wheel; of revolving turrets, and other military devices.

Time. Uniformly increasing one-dimensional variable, which in the present condition of the universe is being marked off into intervals by the constant recurrence of various natural phenomena. In the mere use of the word uniform, however, we are reasoning in a circle, as no notion of uniformity can be gained without the introduction of a time-element. The events most commonly employed to serve as terminal points of time intervals are: 1, the transits of the first point of Aries across the meridian; and 2, the transits of the sun. The period between any two successive transits of the fixed star is practically constant and called the sidereal day; it is evidently the time taken for the earth to turn on its axis once. The corresponding interval for the sun is not uniform from day to day, but its average, taken over a very long period, is used in all physical researches, and called the mean solar day. The $\frac{1}{86400}$ of the mean solar day is the unit of time employed in science, and is called a second. See DAY.

Time. See RHYTHM.

Time Earnings. Wages calculated by the time of work, not by the amount accomplished.

Times. Leading London newspaper, founded 1788 by John Walter, and managed by his descendants. The editors have been T. Barnes, 1816, J. T. Delane, 1841, T. Chenery, 1879, and G. E. Buckle, 1884.

Time-Value. That which an article owes to having been kept from a time when it was less valuable to a time when it is more so.

Timgad. Site in Algeria, 65 m. s.w. of Constantine, on one of the spurs of Aures, with numerous ruins of the ancient Roman Thamugas, a colony of veterans formed after the victories of Trajan over the Parthians. It has paved streets, forum, temples, and fountains.

Timocreon, 5th cent. B.C. Greek lyric poet of Rhodes. Fragments remain.

Timoleon, d.337 B.C. Corinthian patriot and hero, who slew his brother to prevent his becoming tyrant. He headed a force sent 344 B.C., at the petition of Syracuse, for its liberation; drove the tyrants thence and from the other Sicilian cities; and gained a brilliant victory over the Carthaginians on the Crimissus 339. He is the classic model of a devoted and efficient lover of liberty.

Timon, 5th cent. B.C. Athenian misanthrope, celebrated by Lucian and Shakespeare.

Timon OF PHLIUS, ab.280 B.C. Greek philosopher and poet of the skeptical school, at Chalcedon and Athens. Fragments of his *Silloi* or satires remain.

Timor. Island between Australia and Celebes; length ab. 300 m., area ab.12,000 sq. m.; nominally held in part by Portuguese and Dutch. Pop. ab.500,000, chiefly Papuan and Malay.

Timor-Laut, or TENIMBER. Islands e. of Timor. Area ab. 2,200 sq. m., pop. ab.25,000.

Timotheus, 4th cent. B.C. Greek musician.

Timothy, EPISTLES TO. 15th and 16th N. T. books, written probably 64 and 66 in Rome by St. Paul to his young convert and helper; making, with that to Titus, the three Pastoral Epistles.

Timothy Grass. *Phleum pratense.* Valuable fodder and pasture grass, native of Europe, introduced by cultivation into N. America; called also Cat's-tail Grass and Herd's Grass. It is a perennial and will grow in almost all soils and locations. It makes the best kind of hay, especially for horses, and on this account commands a price in cities above its nutritive value. Though not so well adapted to pasturing as Blue Grass, it may be successfully pastured, especially on moist rich soils. The chief objection to it is that it does not leave the land mellow and improved.

Timothy Grass (*Phleum pratense*).

Timperley, C. H., ab.1794–ab.1848. English printer and author. *Printer's Manual,* 1838; *Dict. Printing,* 1839–42; *Songs of the Press,* 1845.

Timrod, HENRY, 1829–1867. Lyric poet of S. C. His verse, collected 1873, has much force and fire.

Tims, THOMAS DILLON, b.1825 in Ireland. Canadian official; financial inspector 1870.

Timsah, LAKE. Since the completion of the Suez Canal, a lake of ab. 6 sq. m., before, a body of brackish water, on the Isthmus of Suez, and supposed to be the sea of reeds crossed by the Israelites at the Exodus. It appears to be the remains of an ancient strait separating Asia and Africa.

Timur. See TIMUR-LENK.

Timur-Lenk, or TAMERLANE, ab. 1336–1405. Son of a Mongol chief; became head of his clan and ruler of Samarkand by 1369. He pushed his conquests to the Dnieper 1393; took Delhi 1398; defeated the Turks under Bajazet on the Plain of Angora July 20, 1402, and prepared 1404 to invade China. He ruled from the Chinese Wall and the mouth of the Ganges to the w. limits of Asia. He was cruel and pitiless, but sagacious and capable.

Tin. Sn. At. wt. 119, sp. gr. 7.29, sp. ht. .056, mpt. 232° C., valence II. IV.; known to the ancients; nearly silver-white metal, with a shade of yellow. It boils at a white heat; expands $\frac{1}{368}$ of its length from 0° C. to 100° C.; latent heat of fusion 14.3 calories; conductivity for heat 15.2, for electricity 14 (silver = 100). It is harder than lead, but softer than gold; very malleable at ordinary temperatures, but brittle at 200° C., and by exposure to great cold undergoes a molecular change which renders it very brittle and granular. Commercial tin may contain iron, arsenic, antimony, lead, copper, bismuth, tungsten, molybdenum and tin oxide, all which tend to harden it and reduce its malleability. Tin is attacked rapidly by hot, concentrated hydrochloric and sulphuric acids, and by ordinary, cold nitric acid; the latter converts it into a white hydrous oxide. It is also soluble in aqua regia and hot, strong caustic soda or potassa; in the latter cases forming stannates of the alkalies. In nature it occurs only sparingly, except in combination with oxygen in the mineral CASSITERITE, SnO_2 (q.v.). This mineral has been found in small quantities in many parts of the world, but has been extensively utilized as a commercial source of tin only in Cornwall, Bolivia, Sumatra and the neighboring islands, and Australia. The tin mines of Saxony and Bohemia have been steady, though small, producers. The tin-bearing deposits of Cal. and the Black Hills do not appear to be in condition to pay for working at present.

Tin, METALLURGY OF. Stream tin is a deposit of grains or pebbles of cassiterite concentrated in pockets in the beds of

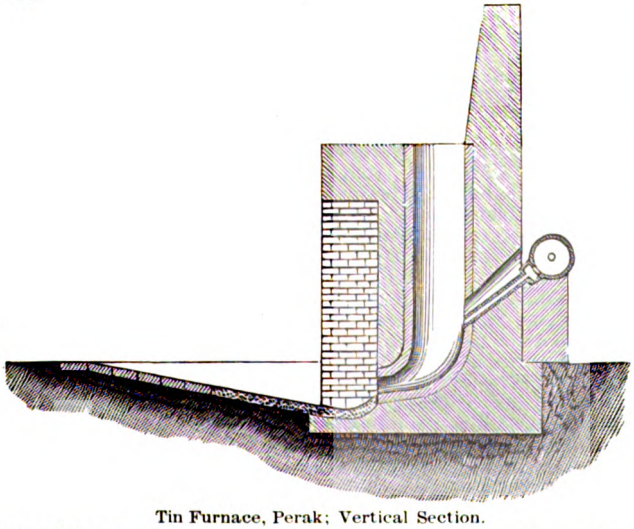
streams, and is obtained by dredging or by diverting the streams from their beds. Wood-tin is wood petrified by cassiterite. Vein tin is the mineral in veins. It is seldom that the vein rock as mined contains over 5 per cent of tinstone, the accompanying minerals being quartz, mica, fluorspar, apatite, feldspar, iron oxides, bismuth, and wolframite. The cassiterite can be separated from all these except the last by gravity concentration, as its specific gravity is so high, 6.5 to 7. The concentrates can be freed from the WOLFRAMITE (q.v.) only by treatment with acid.

The annual production of tin in 1894 was estimated at 83,387 long tons, four-fifths of which comes from the Malay Peninsula, Sumatra and Borneo; ab. one-tenth is mined in Europe, and nearly one-tenth in Bolivia. A large proportion of the ore is shipped to Europe for treatment. It is also found in Australia, Tasmania, S. Dakota and Cal.; the last two localities have not been commercially productive. The market price of tin is 13 cents per lb.

The methods of reducing tin ore are by reduction to impure metal and then refining. The ore is first crushed and concentrated on shaking tables. The ordinary rock, quartz, and metallic oxides are thus removed, while metallic sulphides and arsenides and tungsten compounds with iron and lime remain with the cassiterite. If the sulphides and arsenides are in considerable amount, they are next converted into oxides by roasting, followed by washing with acid to remove the oxides. In case much tungsten remains, this is sometimes removed by melting with a limited quantity of soda, which unites preferably with the tungsten and can be washed out as sodium tungstate, while not enough soda is used to attack the tin stone. Frequently the wolframite is picked out by hand. The concentrates thus obtained may contain 50 to 70 per cent of tin, from ore carrying only 1 or 2 per cent.

The reduction to metal is by a smelting with carbon. In doing this, no more slag must be formed than is absolutely necessary, as tin is always likely to form stannates, and thus pass into the slag. The furnaces used are either reverberatory or cupola, the former being preferred. In operating a reverberatory, 1 to 4 tons of ore is taken, ground fine with one-fifth its weight of anthracite coal, and a small quantity of lime or fluorspar for flux, slightly moistened, and then charged and heated upon the hearth for 5 to 8 hours, with a reducing flame and closed doors. Afterward the heat is raised for 1 to 3 hours to thoroughly separate the tin from the slag, which can then be run off very fluid. In Germany, Australia, and Malacca, shaft furnaces are largely used, of small size, in order to avoid the reduction of iron, etc., with the tin. The furnaces have a sloping bottom, so that the tin as fast as produced runs out of the furnace, and so avoids reoxidation by the blast. The furnaces are up to 10 ft. high, and about 2 by 3 ft. in horizontal section, and the blast is usually introduced by a single tuyere at the back.

The impure tin thus obtained is next refined. Careful heating on an inclined plate or the inclined hearth of a furnace will cause a purer metal to flow away, while such impurities as copper and iron remain largely as a mushy residue. The other



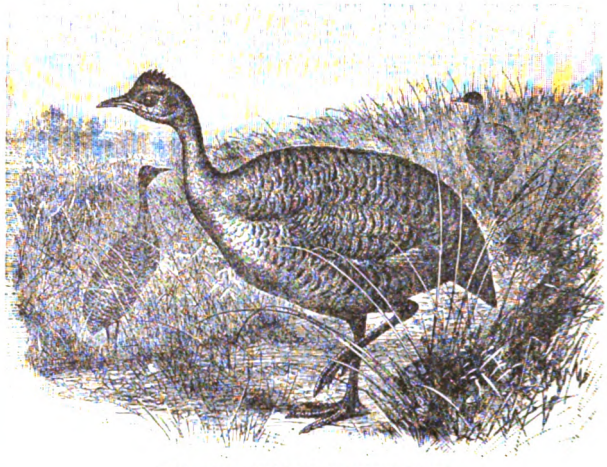
Tin Furnace, Perak; Vertical Section.

impurities can be mostly eliminated by stirring with a pole of green wood. The steam produced oxidizes impurities and also much tin, and vigorously stirs the bath. Various chemicals are used to remove special impurities, such as magnesium chloride stirred in to remove arsenic, but the nature of these reagents is little known outside of the works.

Tin is used alone for making water pipes, for tinfoil, for coating sheet-iron for tin-plate, and for lining copper culinary vessels. Tin amalgam is used for coating mirrors. See BELL METAL, BRITANNIA METAL, COPPER, FUSIBLE ALLOYS, GUN METAL, PEWTER, PHOSPHOR TIN, SOLDER, and TERNE PLATE.

Tinamomorphæ. See TINAMOUS.

Tinamous (type of the TYNAMIDÆ). Central and S. American ground bird, resembling grouse, but with primitive characters, so that recent authors raise it and its relatives to the rank of an order termed *Dromæognathæ* or *Crypturi*. Older authors called them *Gallinacei*. The bill is straight, but bent a little at the tip; the vomer is broad behind and interposed between the pterygoids and palatines; the quadrate bone



Tinamous (*Rhynchotus rufescens*).

has a single head; the wings are raised as in ostriches, and their flight is imperfect, being like that of a projectile, while the short rounded wings vibrate with great vigor, and the birds are quickly tired and easily captured. The pelvis also is ostrich-like, the hinder part of the ischium being free from the ilium. There are over 50 species in the family. The largest is *Rhynchotus rufescens* of the Brazilian Pampas.

Tincal. Crude borax of Tibet, imported into Europe and America.

Tinchebray, or TENCHEBRAY. Town of Normandy, where, Sept. 28, 1106, Henry I. of England defeated and took prisoner his brother Robert, Duke of Normandy.

Tincker, MARY AGNES, b.1833. American novelist, long resident in Rome. *Signor Monaldini's Niece*, 1879; *By the Tiber*, 1881; *Aurora*, 1885.

Tincture. In Pharmacy, an alcoholic solution of a drug, as tincture of opium; or of a combination of drugs, as the camphorated tincture of opium, the ordinary paregoric. The amount of alcohol varies with the drug employed and is determined by the formulæ furnished in the Pharmacopeia.

Tindal, MATTHEW, 1656–1733. English deist. His *Rights of the Christian Ch.*, 1706, was abused at home and valued in France and Germany: his *Christianity as old as the Creation*, 1730, called forth several answers.

Tindale, WILLIAM. See TYNDALE.

Tinder. Inflammable substance; charred lint or rags. German tinder is the soft AMADOU (q.v.).

Tinea. Name applied to several diseases of the skin, caused by the presence of a filamentous fungus. The older writers applied the name to certain forms of disease which more recent research places under other divisions, causing some confusion in the terminology. Ringworm and barber's itch are familiar forms of Tinea.

Tinel, EDGAR, b.1854. Belgian composer; organist at Mechlin 1881.

Tinfoil. Very thin sheets of tin, sometimes alloyed with lead, used for lining tea-chests and for wrapping tobacco and chocolate; also, with the addition of mercury, used in manufacturing mirrors. It is obtained by rolling the metal or by shaving it by machinery from block tin.

Tingey, THOMAS, 1750–1829. Captain U.S.N. 1798; in charge of Washington Navy-yard from 1804.

Tinker's Weed. Name given to FEVERWORT (q.v.).

Tinne, ALEXANDRINA PETRONELLA FRANCINA, 1839–1869. Dutch explorer of the Nile sources 1863–64; murdered by Arabian servants at Fezzan on another journey.

Tinned Meats. See PRESERVATION OF FOOD.

Tinneh (ATHABASCANS, CHIPPEWAYANS). Great group of Indians of related linguistic stock of w. N. America, including: 1. APACHES (q.v.) and Navajos of the s.w. U. S. 2. Group of tribes of region centering in Oregon: of these were probably the Modocs, nearly annihilated in war with U. S. 1873. 3. Indians of the Mackenzie River basin. 4. Alaska Indians, located between the Aleut and the Eskimo. The Canadian Tinneh shape the infant skull into sugar-loaf form. The nose is aquiline, sight keen, features large, and beard considerable. They are bloodthirsty and uncleanly, but temperate and frugal. They subsist by hunting, fishing, and trade in furs. They were polygamous, but have been converted to the R.C. faith. Wives are slaves. They are subject in summer to contagious illusions and dancing manias. The tribes nearest the Eskimo imitate the underground houses of the latter with long low passage. They were cannibals, and human sacrifices were offered.

Tinnitus Aurium. Ringing of the ears, heard in health and sickness. Commonly of no consequence, but often an accompaniment of cerebral disorder. It may be brought on by a large dose of quinine or salicine.

Tino. Same as TENOS (q.v.).

Tinoceras. See DINOCERAS.

Tin Ore, or TIN STONE. See CASSITERITE.

Tin-Plate. Carefully rolled sheet-iron, cleansed from oxide by dipping in dilute sulphuric acid, annealed in iron boxes and polished with emery and oil between rolls, is dipped in melted tin, covered with tallow. It is then dipped in another pot of tin, the excess of tin removed in a pot of hot tallow and polished with bran. Tin-plate was invented in Bohemia ab. 1500; in England it was first made 1670.

Tin Pyrites. See STANNITE.

Tin Salts. See STANNOUS CHLORIDE.

Tinsel. Thin sheets of glittering metal, used for decorations and theatrical costumes.

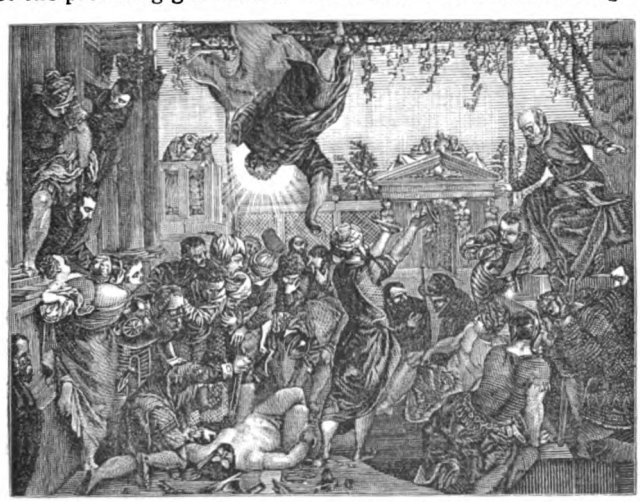
Tinstone. See CASSITERITE.

Tintagel. Ruined castle in w. Cornwall, legendary seat of King Arthur.

Tintern Abbey. In Monmouthshire, Eng., on the Wye, founded 1131 by Cistercians. Its ruins, especially those of its church, built ab.1290, are famed for beauty.

Tint of Passage. See TRANSITION TINT.

Tintoretto (ROBUSTI), JACOPO, 1518–1594. Venetian painter, unduly exalted by Ruskin, but possessed of great originality and ambition, though occasionally lacking the solid quality of the preceding generation. He has fine works in the Doge's



Miracle of St. Mark, by Tintoretto.

Palace. His *Paradise*, also there, is less admirable. *The Miracle of St. Mark*, in the Venice Academy, is one of his greatest pictures.—His son, DOMENICO, was also a painter of merit, though little known.

Tintype. See FERROTYPE.

Tip-Cat. Almost universal child's game, played with a small billet of wood, which is struck with a club from the ground and knocked into the air. The billet is usually pointed at the ends; otherwise, it is placed beside a small depression in the ground. Tip-cats with pointed ends were found with tops by Petrie in the Fayum, Egypt (ab.1600 B.C.). In Russia, tip-cat is called the goat game; among the Persians, the frog game. It is played as an apparently indigenous game by the Zuni children of New Mexico, who call it the jumping-frog game. It also occurs in parts of Japan, where the bat is called father and the billet son.

Tippecanoe. River of Indiana, ab. 200 m. long, branch of the Wabash; famous from a battle fought on its banks, Nov. 7, 1811, when the Indians were defeated by Gen. W. H. Harrison: his nickname during the Presidential campaign of 1840.

Tippoo Saib, 1749–1799. Son of Hyder Ali; Sultan of Mysore 1782; ally of the French; at war with the British till 1784, 1790–92, and 1798; defeated and slain at Seringapatam.

Tipton, JOHN, 1786–1850. U. S. Senator from Ind. 1831–39.

Tipton, THOMAS W., b.1817. U. S. Senator from Neb. 1867–75.

Tipula. See DADDY-LONGLEGS.

Tipulariæ. See NEMOCERA.

Tiraboschi, GIROLAMO, 1731–1794. Prof. Milan; librarian at Modena from 1770; historian of Italian literature. His chief work, 13 vols., 1772–82, extends to 1700; it was continued by Lombardi.

Tirard, PIERRE EMMANUEL, 1827–1893. French Deputy 1876, Minister 1879–81, Premier 1887–88 and 1889–90.

Tiresias. Theban seer, blind and aged; connected with many events in the mythical history of Greece.

Tirhakah, d.664 B.C. King of Ethiopia 702, and of Egypt ab.693 B.C.; at war with Assyria; ally of Hezekiah of Judah; called Taracus by Manetho, and Tearcho by Strabo. II. Kings xix. 9.

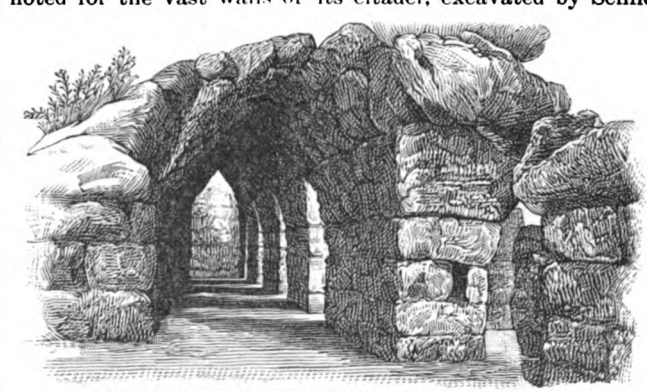
Tiro, MARCUS TULLIUS, 1st cent. B.C. Freedman of Cicero, and editor of his works; reputed inventor of Latin shorthand writing.

T-Iron. Wrought-iron or steel bar whose cross-section has the shape of a letter T; used in bridge and roof construction.

Tironian Notes. See SHORTHAND and TIRO.

Tirso de Molina. See TELLEZ.

Tiryns. Greek city in Argolis, destroyed ab.468 B.C.; noted for the vast walls of its citadel; excavated by Schlie-



Covered Passageway of Cyclopean Masonry in Tiryns.

mann 1884–85. The Cyclopean walls of Tiryns and of the neighboring city of Mycenæ are the grandest in Greece. The early life of Hercules was spent here.

Tischbein, JOHANN HEINRICH WILHELM, 1751–1829. German painter and engraver, in Naples 1787–99.

Tischendorf, LOBEGOTT FRIEDRICH KONSTANTIN VON, D.C.L., LL.D., 1815–1874. Prof. Leipzig from 1845; ed. N. T. text; discoverer, at the monastery on Mt. Sinai, of the *Codex Sinaiticus* (in instalments), 1844–59, pub. 1862.

Tisri. Hebrew month corresponding to part of Sept.–Oct. The 1st of the civil and the 7th of the ecclesiastical Hebrew year.

Tissandier, GASTON, b.1843. French aeronaut, who ascended 5½ m. 1875.

Tissaphernes, assassinated 395. Satrap in Asia Minor 414 B. C.; defeated by Agesilaus.

Tisserand, FRANCIS FELIX, 1845–1896. Director observatory at Toulouse 1873, and Paris 1892.

Tissot, JAMES, b.1836. French painter, long in London; noted of late for his biblical scenes.

Tissues. Vegetable or animal structures composed of cells.

'Tis the last Rose of Summer. Song by Moore, adapted by him to an old Irish tune, "The Groves of Blarney," which he greatly changed in character. Flotow introduced it in his opera *Martha* with fine effect; Beethoven arranged it for voice, pianoforte, violin, and violoncello, with words beginning "Sad and luckless was the season"; and Mendelssohn wrote a fantasia (Op. 15) on the melody.

Tisza, KOLOMAN BOROSJENO, b.1830. Hungarian Premier 1875–90.

Titania. Queen of the fairies and wife of OBERON (q.v.).

Titanic Acid. White powder; soluble in the common acids; varying in composition from $Ti(OH)_4$ to $Ti_2O_3(OH)_2$; prepared by precipitating a titanate. On ignition it yields titanium dioxide.

Titanichthys. Hugest Placoganoid yet known; found in the Devonian rocks of Ohio. The head-shield alone is ab. 5 ft. long by 5 wide: the jaws, a yard in length, are set with formidable teeth. See PLACODERM.

Titaniferous Iron Ore. Known as ilmenite, menaccanite, and by other names, according to the quantity of titanium present and its effect on the quality of the ore.

Titanite. See SPHENE.

Titanium. Ti. At. wt. 48, sp. gr. 3.58, sp. ht. .13, valence II. III. IV.; discovered by Gregor 1789; prepared by fusing potassium fluotitanate with potassium or sodium; gray amorphous powder, resembling reduced iron. It has not been prepared in pure condition. It unites energetically with oxygen, and readily with nitrogen at high temperatures. It is soluble in the common acids. It occurs combined with oxygen in several minerals, the more important of which are rutile and brookite, both having the composition TiO_2. It is frequently found in iron ores, increasing the difficulty of the smelting process by its infusibility, and sometimes in quantity so large as practically to destroy the value of the ore. It is used in porcelain painting and in the preparation of enamels.

Titanium Bromide. $TiBr_4$. Amber yellow, well crystallized substance; mpt. 39° C., bpt. 230° C.; made by passing bromine vapors over a heated mixture of carbon and titanium dioxide.

Titanium Chlorides. Dichloride. $TiCl_2$. Brown powder, which burns like tinder on exposure to the air.—Sesquichloride. Ti_2Cl_6. Violet scales, made by passing the vapor of the tetrachloride and hydrogen through a red-hot tube: powerful reducing agent.—Tetrachloride. $TiCl_4$. Mobile, colorless liquid, made by heating a mixture of the dioxide with carbon, in chlorine.

Titanium Dioxide. TiO_2. Found in nature as rutile, anatase, and brookite; white powder, prepared by heating titanic iron ore with hydrochloric acid and chlorine; soluble in concentrated sulphuric acid.

Titanium Disulphide. TiS_2. Substance resembling pyrites; made by fusing together rutile, sulphur, and sodium carbonate.

Titanium Iodide. TiI_4. Brownish-red octahedra or prismatic needles; mpt. 150° C.; made by passing iodine vapor over heated titanium.

Titanium Sesquisulphide. Ti_2S_3. Metallic looking, grayish-black substance; made by passing carbon disulphide vapor over the heated dioxide.

Titanium Tetrafluoride. TiF_4. Yellow oil, formed in small quantities by treating fluorspar with sulphuric acid.

Titanium Trifluoride. TiF_3. Violet powder, obtained by heating potassium fluotitanate in a stream of hydrogen.

Titanotherium. Genus of extinct mammals found in the Bad Lands of S. Dakota. Brontotherium is an allied genus. See BRONTOTHERIDÆ.

Titans. 1. Twelve children of Uranus and Gæa, who deposed their father; cast into Tartarus by Zeus. 2. Their descendants, as Prometheus and Hecate.

Titcomb, TIMOTHY. See HOLLAND, JOSIAH G.

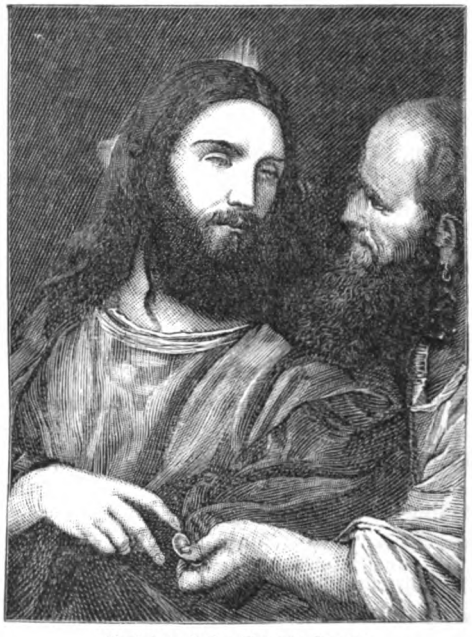
Tite, SIR WILLIAM, F.R.S., 1802–1873. English architect and banker; M.P. 1855, knighted 1869.

Tithes. Tenth of produce, devoted to religious uses; first mentioned Gen. xiv. 20 and xxxiii. 22; paid to the Levites, and from ab.350 irregularly to the clergy; not enjoined in N. T. The connection of Church and State in England and elsewhere is based on a commutation of tithes.

Tithing-Man. In England, a kind of constable; in New England, a yearly elected officer who enforced attendance at public worship.

Tithonus. Son of Laomedon, beloved by Aurora (Eos), who obtained for him the gift of immortality but without eternal youth; changed to a grasshopper.

Titian (TITIANO VECCELLI or VECELLIO), 1477–1576. Greatest Venetian painter. His masterpieces are: in Rome, Borghese Gallery, *Divine and Earthly Love, Blindfolding of Cupid;* in Florence, the *Flora* and *Venus* of the Uffizi, the *Bella* of the Pitti; in Dresden, *Christ and the Tribute Money,* and *Venus;* in Venice, the *Presentation of the Virgin,* the *Assumption;* in



Christ and the Tribute Money.

the National Gallery, London, *Bacchus* and *Ariadne.* There are many fine Titians in Madrid, and others in galleries already named and elsewhere. The excellence of this artist is his coloring, which is unrivaled except by contemporary Venetians, none of whom are wholly his equals, except Giorgione, whose works are extremely rare.

Titicaca. Lake on the Andean plateau, in Peru. Area ab. 3,200 sq. m., elevation 12,846 ft., greatest depth ab. 750 ft.

Titiens, or **Tietjens,** TERESA CAROLINE JOHANNA, 1831–1877. Hungarian-German soprano singer, well known in England; in the U. S. 1876.

Titinius. Roman dramatist, writer of comediæ togatæ ab.170 B.C. Fragments remain.

Title. Means by which one becomes lawful owner of property. It includes, when complete in one person, possession, right of possession, and right of property.

Title-Deeds. Deeds evidencing a person's right or title to lands, otherwise muniments of title.

Tits (TOM-TITS, TITMICE). True tits include birds of the family *Paridæ,* mostly Old World forms, highly colored with azure, white, red, and black. They breed in holes in trees, but the Long-tail or Bottle-tit makes a pendent nest. 5 species are found in Gt. Britain, and 15, which are dull colored, are American: *e.g.,* the Chickadee and the white and red-breasted Nuthatches or Sap-suckers: they feed exclusively on insects. The Hill-tits, belonging to the family *Leiotrichidæ,* include 60 species of bright-colored birds of the Oriental region. Of these the Red-bill, falsely called Japanese Robin, is often kept in confinement: it is not native to Japan. The Ground-tit (Wren-tit) of Cal. lives on shrubby hillsides that are almost devoid of rain, and belongs to the family *Troglodytidæ.*

Tit-Tat-To. Child's game, played by two persons on a

slate, or with pencil and paper, on a diagram formed by two straight lines crossed by two lines at right angles. The players alternately put down a cross and a circle in the divisions, the object being to get three marks of the same kind in a row. There is no historical explanation of the game, but the form of the diagram and the symbols used, from comparative studies, suggest a divinatory origin and a primitive cosmical significance. See NOUGHTS AND CROSSES.

Titular Bishop. Formerly bp. "in partibus infidelium"; one consecrated to a merely titular diocese, now occupied by Mohammedans.

Titus, EPISTLE TO. 17th N. T. book; written ab.65 by St. Paul to a Gentile convert and helper. See TIMOTHY.

Titus Flavius Sabinus Vespasianus, 40–81. Tenth Roman emperor; son of Vespasian. He ended the Jewish

Titus.

war by the capture of Jerusalem Sept. 8, 70, became Cæsar ab.71, and emperor 79. In his reign occurred an eruption of Vesuvius, a destructive fire at Rome, and a pestilence. He finished the Colosseum, reigned wisely and well, and was called "the delight of mankind." See ROME.

Titus Livius. See LIVIUS, T.

Titusville. City of Crawford co., Pa., 100 m. n. of Pittsburg. It has been an important oil center since 1859, when Drake drilled the first successful well on Oil Creek, 2 m. s. of the city.

Tiuchev, FEDOR IVANOVICH, 1803–1873. Russian diplomat and writer of short poems, which suddenly became popular in 1854.

Tivoli. Ancient Latin town, 18 m. e. of Rome. As Tibur it was the summer-resort of Marius, Scipio, Mæcenas, Horace, and other Romans. It has some notable ruins, and works, opened 1892, for the electric lighting of Rome. Pop. ab. 11,000.

Tivoli. Simple form of bagatelle, played upon an inclined board set with pins, with a marble, which is either shot with a spring or shoved with a stick from a channel at one side. The marble, in rolling down the board, rebounds among the pins, and stops either in a hole on the board, or in numbered compartments at the bottom, which determine the count.

Tiza. Commercial name for an impure ULEXITE (q.v.) found in S. America.

Tlaloc. Mexican god of rain; worshiped with sacrifices of prisoners and children.

Tlascala, or TLAXCALA. Former republic and town near Mexico city. Its warriors fought the Mexicans, and aided Cortes in his conquest.

Toad-Fish. See BATRACHIDÆ.

Toad-Flax. See SNAPDRAGON and BUTTER-AND-EGGS.

Toads. See OXYDACTYLIA and BUFONIDÆ.

Toad's-Eye. Variety of wood-tin, occurring in small rounded grains with a concentric and radiated structure. See TIN, METALLURGY OF.

Toadstone. 1. That of antiquity, so named from some fancied resemblance of form, was probably a fossil. 2. That of Derbyshire, England, is a dark, compact rock, like basalt, intruded among Carboniferous strata. The name may be a corruption of the German todtstein (dead stone), with allusion to the absence of ore. 3. Varieties of rock with peculiar mottled surfaces.

Toadstool. Varieties of *Fungi* of the class *Hymenomycetes*, of very wide geographical distribution, many of them poisonous. See MUSHROOM.

Toast. Bread that has been toasted loses some of the water of composition, one evidence of this being the carbonizing or browning, and the starch is partially changed into compounds more quickly digested. To accomplish this the bread should be slowly browned. A very pleasant drink for invalids is made by pouring hot water over some well-browned toast and serving after it has cooled.

Toast. This was an addition to English drinks in the 16th century, sack and punch being drunk with it. In the 17th century it was customary to drink to the health of the host and guests, and especially woman, who was called the toast.

Tobacco. *Nicotiana tabacum.* Annual herb of the Potato family, native of America; widely cultivated for its leaves. It thrives best on rich alluvial soils. The young plants are started in beds, and transplanted to the field, ab. June 1, on soil that has been thoroughly prepared and well fertilized. Clean culture is given, and the seed stalk removed when it appears. When the leaves are mature, the plant is cut and hung up under cover to cure. When cured, the leaves are taken off, assorted, and packed in bundles for fermenting. *N. rustica* is the only other species much cultivated, and is grown in Asia, Africa and Europe. Tobacco contains 2 to 6 per cent of the alkaloid NICOTINE (q.v.), a cerebro-cardiac poison. Taken internally tobacco causes nausea; when smoked or chewed it is sedative or narcotic; in excess it affects the pulsations of the heart. Tobacco removes a large amount of mineral matter from the soil, and is therefore an exhausting crop. It was found to be in use by the Indians in all parts of America. Oviedo says the peculiar Y-shaped tube by which they inhaled the fumes was called tabaco; Benzoni says tabacco is the Mexican name of the herb. It is said to have been used by Spaniards in Yucatan 1520. It was first brought to Spain 1558, and to England ab. 1565. In 1586 Ralph Lane, Gov. of Va., and Sir Francis Drake

1. American Tobacco (*N. tabacum*); 2. Syrian Tobacco (*N. rustica*).

furnished Sir Walter Raleigh with materials for smoking. A Proclamation against it was issued 1584. James I. issued his "Counterblaste" against it 1604. Its cultivation in England was prohibited 1684; allowed in Ireland 1779, prohibited 1831. The U. S. in 1894 raised 406,678,385 lbs., valued at $27,760,739, and exported to the value of $23,849,996. The yield per acre

is ab. 678 lbs. Europe produces about the same amount as the U. S. In the U. S., in 1893, 84,428,797 lbs. were made

Gathering the Crop.

into 4,341,240,981 cigars, and 12,497,183 lbs. into 3,660.755.959 cigarettes. See PIPES, TOBACCO.

Tobacco, INDIAN. *Lobelia inflata.* Low, blue-flowered herb of the Lobelia family, with an intensely bitter foliage, native of e. N. America. The powdered leaves and seeds affect the brain and spinal marrow, and irritate the stomach and bowls; they have produced death. It contains a narcotic alkaloid, lobelin, a non-volatile oil, which forms crystalline salts.

Tobago. One of the Windward Isles, W. Indies; area 114 sq. m.; held by Dutch and French 1632–1763, and since by Britain; connected with Trinidad. Pop., 1891, 18,353.

Tobit. Apocryphal book, describing sundry marvelous deliverances and cures in the family of a Jewish exile; called in the Vulgate Tobias.

Tobler, TITUS, 1806–1871. Swiss traveler in Palestine. *Topographio von Jerusalem*, 1853–54; *Nazareth*, 1868; *Palestinæ Descriptiones* (300–1500), 1867–74.—His son, ADOLF, b.1835, prof. Berlin since 1867, is an authority on Romance philology.

Toboggan. This was originally an Indian pack-sled, peculiar especially to the Canadian-French. It was made of thin strips of wood curled up at the front. From this was developed the sled of sport, of birch ¼ in. thick, 16 in. wide, and carrying 3 to 8 persons; made to run on snow or ice with runners, or rollers to run in chutes. The term tobogganing is now used to include all sliding by means of low sleds on artificial hills of various kinds, some of which end in a prepared water-plunge.

Tobolsk. Capital of a district of w. Siberia; on the Irtish and the Tobol. It has manufactures of tallow, soap, and leather, and shipbuilding. Pop., 1891, 22,651.

Tocantins. River of e. Brazil, flowing ab. 1,500 m. n. to the Para; partly navigable. Its tributary, the Araguay, is ab. 1,300 m. long.

Toccata. Composition for keyed instruments of the organ and pianoforte kind; piece of persistent movement, with little variation in the time value of the notes, and frequently sounding like improvisations.

Tocogonia (BIOGENESIS). Production of living things (children) from pre-existing living things (parents).

Tocology. Science of child-birth: OBSTETRICS (q.v.).

Tocqueville, ALEXIS CHARLES HENRI CLÉREL DE, 1805–1859. French author; Deputy 1839, Academician 1841. His *Democracy in America*, 4 vols., 1835–40, is highly valued. *The Old Régime and the Revolution*, 1856; *Remains*, 1861; *Works*, 9 vols., 1860–65; *Recollections*, tr. 1897.

Tod, DAVID. 1805–1868. U. S. Minister to Brazil 1847–52; Gov. of Ohio 1862–63.

Toda, or TUDAWA. Dominant race of a section of s. India, though in number less than 750. They have a language, religion, and customs of their own.

Todd, CHARLES SCOTT. 1791–1871. Officer in the war of 1812; Ky. Sec. of State 1817; U. S. Minister to Russia 1841–45.—His father, THOMAS, 1765–1826, became Judge of Ky. Court of Appeals 1801, and Chief-justice 1806; Justice U. S. Supreme Court 1807.

Todd, DAVID PECK, b.1855. Prof. of Astronomy at Amherst since 1881; member of several expeditions to observe eclipses from distant points.

Todd, ELI, M.D., 1769–1833. Founder and supt. Retreat for the Insane at Hartford, Conn.

Todd, HENRY JOHN, 1763–1845. Archdeacon of Cleveland 1832; editor and biographer of Milton and Spenser.

Todd, JOHN, D.D., 1800–1873. Cong. pastor at Pittsfield, Mass., 1842–72; prolific writer. *Student's Manual*, 1835; *Lectures to Children*, 1834–58; *Autobiography*, 1876.

Todd, JOHN BLAIR SMITH, 1814–1872. Brig.-gen. U. S. Vols. 1861–62; M.C. from Dakota 1863–65; Gov. 1869–71.

Toddy. In the E. Indies, the fermented juice of the palm from which arrack is distilled. In Scotland, whisky punch, a mixture of hot water, sugar and whisky.

Todhunter, ISAAC, 1820–1884. English mathematician. Author of a valuable series of text-books. *Researches in the Calculus of Variations*, 1872; *Attraction and the Figure of the Earth*, 1873; *Hist. Theory of Elasticity*, 1886.

Todleben, FRANZ EDUARD, 1818–1884. Russian officer, whose engineering skill rendered possible the long defense of Sevastopol (349 days) against the Allied armies; Lieut.-gen. 1860. He besieged and took Plevna 1877. *Defense of Sevastopol*, 1863.

Toe of Switch. Ends of the movable rails of a railroad switch.

Tofana. See AQUA TOPHANIA.

Toggle Joint. Made by two hinged bars meeting at an angle of almost 180°; if a side force then acts upon the hinge, a large force of compression can be produced in the two bars. Such a joint is used in the stone crusher and in many printing presses.

Togo. Town of German W. Africa in Togoland, a German protectorate, on the e. shore of Lake T. It is one of the principal trading stations of Togoland. Pop. 3.000.

Tokay. Town of n.e. Hungary, on the Theiss; pop. 5,012. The wines hence exported are of high repute. Analysis of a Tokay wine showed 16 per cent alcohol, 74 grs. sugar per oz., and acidity equivalent to 9 grs. tartaric acid per oz. The annual product of the best varieties amounts to 4,000,000 gals. and of the second-class 2,500,000 gals.

Token Money. Coins whose intrinsic value is much less than their face value, as the 1-cent and 5-cent copper and nickel coins, and the silver coins of the U. S.

Tokens. Metallic cards, made in various countries for advertising and other purposes; especially those formerly issued in Scotland, admitting the holder to communion. They have an obscure place in numismatics.

Tokio (formerly YEDO). Capital of Japan; seaport, at the head of Yedo Bay, on the e. coast of Niphon; settled in 15th century, and important since 1590. It has a large trade and

Business Street in Tokio.

commerce, in this respect ranking next to Osaka, and is an educational center, but has been repeatedly devastated by fires. Pop., 1890, 1,376,280.

Tokugawa. Japanese dynasty, founded by Iyeyasu, who became Shogun 1603, after gaining a great victory over the daimios 1600. It lasted through 15 generations, to the resignation of Yoshinobu (Keiki) 1867.

Toland, JOHN, 1669–1722. Irish deist, driven from Dublin for his *Christianity not Mysterious*, 1696; editor and biographer of Milton, 1697–98. *Amyntor*, 1699; *Origines Judaicæ*, 1709; *Nazarenus*, 1719.

Toledo. Ancient city of Spain, on the Tagus, 40 m. s.s.w. of Madrid; capital of the Goths 467–714, then of the Moors till 1085, and of Castile till 1560; once prosperous, populous, and

Toledo.

famous for its sword-blades; now decayed. Its university, founded 1498, was suppressed 1807: its palace was burned 1887. Its fine cathedral, erected 1227–1493, is 404 ft. by 204, with a tower 329 ft. high. Pop. ab.21,000.

Toledo. Capital of Lucas co., Ohio, on the Maumee, at the w. end of Lake Erie; settled ab.1795, chartered 1837. It has 25 m. of docks, providing for a large lake trade, and extensive railroad connections, being touched by 23 lines. Its manufactures are varied. It has 356 m. of streets, and 95 m. of street railways. Water is supplied by pumping. Pop., 1890, 81,434.

Toledo, ANTONIO SEBASTIAN DE, MARQUIS DE MANCERA. Viceroy of Mexico 1664–73.

Toledo, FRANCISCO DE, ab.1517–1584. Viceroy of Peru 1569–81; able ruler; executioner of the last Inca; imprisoned in Spain.—His cousin, GARCIA, ab.1510–1583, drew up a code for Peru, and was provincial of the Dominicans there 1577–81.

Toledoth Jeshu (GENERATIONS OF JESUS). Mediæval Hebrew book, similar to the apocryphal gospels, but satirical and anti-Christian. Two forms exist, tr. into Latin 1681 and 1705.

Toledo War. Dispute as to Ohio-Mich. boundary, 1836–37. Mich. received the n. peninsula in lieu of her claim to the region about Toledo.

Toleration. Exemption from persecution; partial or entire liberty granted to dissenters from an established church. The idea scarcely existed before the Reformation, and thenceforth made its way slowly, being proclaimed by a few French, Swiss, and Polish thinkers, and enforced, so far as he could, by William the Silent in Holland. Religious freedom was secured in some degree in France by the Edict of Nantes 1598, and in Germany by the Peace of Westphalia 1648. The notions and practices of the past in this respect were practically antipodal to those which now prevail in civilized lands.

Tolidine. $C_{12}H_6.(CH_3)_2.(NH_2)_2$. Diamidoditolyl; compound analogous to benzidine, and similarly used in the preparation of dye-stuffs; prepared by the rearrangement of hydrazotoluene; known in various forms, as orthotolidine, mpt. 128° C., used in the manufacture of cotton dyes, *e.g.*, benzopurpurin, azoblue.

Tolima. Peak of the central Cordilleras in Colombia. It is a quiescent volcano, 18,425 ft. high, which showed signs of activity in 1595, 1826 and 1829.

Tollens, HENDRIK, 1780–1856. Dutch poet and dramatist, best known by his lyrics.

Tolly. See BARCLAY DE TOLLY.

Tolon, MIGUEL TEURBE, 1820–1858. Cuban poet, in New York 1848–57.

Tolosa. Town of n. Spain, taken by the French 1794 and 1808. Near it the kings of Castile, Aragon, and Navarre defeated the Moors July 16, 1212.

Tolsa, MANUEL, ab.1750–ab.1810. Spanish sculptor and architect, in Mexico from 1781; noted especially for an equestrian statue of Charles IV., erected in Mexico City 1803.

Tolstoi, ALEXEI, COUNT, 1817–1875. Russian dramatist and lyric poet. *Death of Ivan*, 1865, tr. 1869. His only novel, *Prince Serebryani*, was tr. 1893.

Tolstoi, DIMITRI, COUNT, 1823–1889. Russian Minister of Education, noted as a zealous instrument of tyranny. *Romanism in Russia*, tr. 1874.

Tolstoi, LEO or LYEFF, COUNT, b.1828. Russian novelist of highest rank. His chief works are *War and Peace*, 1865–68, and *Anna Karenina*, 1875–78. He has also pub. many shorter tales, sketches, and tracts, intended for the peasants to whom his later years have been devoted, or for the propagation of his peculiar religious ideas. Some venerate him as the chief apostle and model of realism, others as a missionary and reformer: whatever may be thought of his judgment, his genius and sincerity are alike undoubted. *The Kreutzer Sonata*, 1888; *Ivan Ilich*, 1884; *Master and Man*, 1895.

Toltecs. Indians of Mexico who emigrated s. into Yucatan, where they may have introduced the Mayan civilization, or perhaps gained their own from a more ancient type. Later they went n. and established a predecessor of the Aztec civilization in Mexico. They were conquered by the Nahuatt, also

Toltec Girl.

from the n., who as Aztecs were overthrown by Cortes. The theory that the T. culture was introduced from the Orient does not appear well supported. Their empire is said to have lasted ab.686–1070: its downfall was due in part to dissensions between priests and nobles.

Tolu Balsam. Viscid substance, obtained from trees of *Myroxylon toluifera*, found in S. America. Upon exposure it hardens to a vitreous mass. Its flavor suggests vanilla. It contains cinnamic and benzoic acids, benzyl benzoate, and cinnamate. It is used in perfumery and confectionery, and as a mild tonic in bronchial affections.

Toluene. $C_6H_5.CH_3$. Toluol. Methylbenzene; liquid hydrocarbon with pleasant odor; bpt. 110° C.; present in coal tar, and prepared from it by distillation. Oxidizing agents convert it into benzoic acid. It is used as a solvent, as a source for nitrotoluene, toluidine, and SACCHARIN (q.v.).

Toluic Acid. $CH_3.C_6H_4.COOH$. Known in three forms, prepared by the partial oxidation of the xylenes. α-Toluic acid is an isomer.

Toluidines. $CH_3.C_6H_4NH_2$. Bases closely resembling aniline; known in three forms, ortho, meta, and para; prepared by the action of reducing agents upon the three nitrotoluenes. Orthotoluidine is a liquid, boiling at 199°C.; metatoluidine boils at 197° C.; paratoluidine is a solid melting at 45° C. The ortho and para compounds are much used in making coal-tar colors.

Toluylene. $CH_3.C_6H_3$. Group or radical, recognized in

numerous forms; derived from toluene by the removal of two hydrogen atoms. $CH_3.C_6H_5—H_2=CH_3C_6H_3$:.

Toluylene Blue. $C_{15}H_{20}N_4Cl$. Product of the action of nitrosodimethylaniline on toluylenediamine.

Toluylenediamine. $CH_3.C_6H_3:(NH_2)_2$. Diamidotoluenes; bases formed by the reduction of the dinitrotoluenes, resembling in every way the PHENYLENEDIAMINES (q.v.).

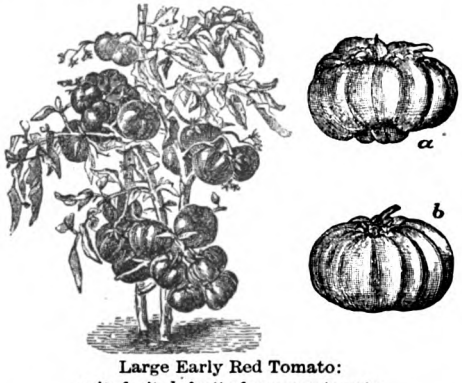
Toluylene Red. $C_{14}H_{16}N_4.HCl$. Product of the oxidation of dimethylparaphenylenediamine and toluylenediamine. It dyes cotton red upon a tannin mordant.

Tom. River of w. Siberia, rising in Abakan Mts., flowing w., n., n.w. and joining the Ob, 27 m. below Tomsk. Length 525 m.

Tom, BLIND (THOMAS GREENE BETHUNE), b.1849 in Ga. Illiterate negro pianist, well known as a musical prodigy from 1861.

Tomahawk. War club of N. American Indians.

Tomato. *Lycopersicum lycopersicum.* Large herb of the Potato family, native of S. America; widely cultivated for its fruit; called also Love-Apple. The tomato blight is caused by



Large Early Red Tomato:
a, its fruit; *b*, fruit of common tomato.

Cladosporium fulvum, an imperfect fungus, which forms rusty brown patches on the under side of the leaves, causing the death of the plant. Spraying with copper sulphate solution destroys it.

Tomato Blight. See TOMATO.

Tomb. Monument over a grave. In early times the dead were sometimes placed in excavated sepulchers, especially in the East. The pyramids of Egypt, the rock-tombs of Persia, and the catacombs of Rome are examples. When the dead were cremated and the ashes placed in cinerary urns, the columbarium was provided to receive them. In some Spanish-American towns and in Italy, the niches for the coffins are built in terraces. In early Christianity the dead were not buried in churches. In the Middle Ages tombs were built in the churches, beginning with a stone coffin, followed in the 13th century by a sarcophagus with a recumbent figure in stone, beneath a canopy. Sometimes they were placed in arched recesses in the wall. See BURIAL OF THE DEAD.

Tombac. Red, hard alloy of copper and zinc, containing 15 per cent of zinc. White tombac consists of copper 75, arsenic 25. Imitation gold jewelry is made of the former.

Tombigbee River. River of Miss. and Ala. It heads in the broken plateau country of s.e. Miss., and flows 450 m., generally s., forming, with the Ala., Mobile River. Drainage area 18,896 sq. m.

Tombs, SIR HENRY, 1824–1874. Anglo-Indian officer, distinguished at Delhi and Lucknow in the Sepoy rebellion; Col. 1858, Major-gen. 1867.

Tomentose, or TOMENTULOSE. Having the surface covered with woolly pubescence.

Tomentum. Covering of woolly nature.

Tomes, ROBERT, M.D., 1817–1882. American historical writer and translator. *Battles of America*, 1861; *War with the South*, 1864–67.

Tomia. Outer part of gape of mouth of birds, from tip of beak to rictus.

Tomline, GEORGE, D.D., 1750–1827. Bp. of Lincoln 1787, and of Winchester 1820. *Christian Theology*, 1799.

Tomlinson, CHARLES, F.R.S., b.1808. Writer on science and letters. Tr. *Inferno*, 1877; *Essays*, 1887.

Tomlinson, GIDEON, 1780–1854. M.C. 1819–27; Gov. of Conn. 1827–31; U. S. Senator 1831–37.

Timlinson, HERBERT, b.1845. English physicist and electrician.

Tommaseo, NICCOLA, 1802–1874. Italian author and compiler. *Dell' Italia*, 1835; *Canti Populari*, 1841–42; *Studi critici*, 1843.

Tompkins, DANIEL D., 1774–1825. Judge N. Y. Supreme Court 1804–7; Gov. of N. Y. 1807–17: able and active, especially during the war of 1812; Vice-pres. U. S. 1817–25.

Tomsk. Town of w. Siberia, on the Tom; partly burned 1890; seat of a university, founded 1888. Entrepot for imports and exports of Siberia. Pop., 1891, 41,632.

Tom Thumb. See STRATTON, C. S.

Tom Tiddler's Ground. Variety of game of tag. The chaser or player who is "it" guards a certain piece of ground upon which the other players, trespassing, may be caught. The one caught then takes his place.

Ton. In the U. S. and Gt. Britain 2,240 lbs.; short ton in the U. S. is 2,000 lbs., metric ton is 2,204.6 lbs. In the measurement of ships the register ton is 100 cu. ft.; for cargo 40 cu. ft.; in Gt. Britain 42 cu. ft.

Tonalite. Igneous rock having a granitic structure; a quartz-mica diorite.

Tone. Musical sound due to sonorous bodies vibrating with a regular periodicity. Tones make up one of the two great classes of sounds, and are distinguished from noises, which are due to irregular vibrations. See HEARING.

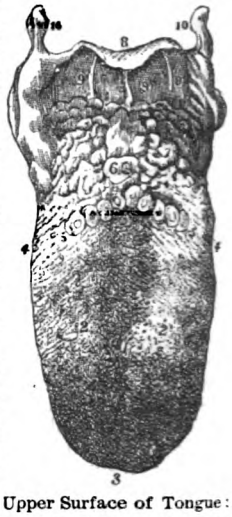
Tone, THEOBALD WOLFE, 1763–1798. Irish revolutionist; officer in French expeditions of invasion 1797–98; capitally condemned. He cut his throat in prison. His autobiography, 1826, was edited by his son, WILLIAM THEOBALD WOLFE, U.S A., 1791-1828. *School of Cavalry*, 1824.

Tone-Color. Quality of spoken sounds. See PROSODY.

Toner, JOSEPH MEREDITH, M.D., 1825–1896. Practitioner at Washington, D.C.; medical and biographical writer.

Tonga. See FRIENDLY ISLANDS.

Tongue. Muscular organ in the cavity of the mouth. It has a single attachment at its base and is capable of quick and varied movement. It aids in sucking, in mastication, in articulation. The nerves concerned in the sense of taste are distributed in the tongue, making it the organ of taste.



Upper Surface of Tongue:
1, mesial line; 2, 2, lateral parts; 3, tip; 4, 4, sides or edges; 5, 5, V-shaped mass of circumvallate papillæ; 6, foramen cæcum; 7, mucous glands; 8, epiglottis; 9, 9, 9, fræna epiglottidis; 10, 10, greater horns of hyoid bone.

Tongue of a Frog. In a railroad, triangular piece which unites the ends of the two rails which meet.

Tongues, GIFT OF. Described in Acts ii. as a sudden communication of the skill to speak foreign languages; in I. Corinthians xiv. as ecstatic utterances, the vehicle of profound spiritual experiences, but not of distinct apprehension, even to the speaker.

Tonics. Class of remedies supposed to give tone to the system, without stimulation on the one hand or supplying nutriment on the other. Special tonics, as nervous tonics, are sometimes mentioned, indicating the characters of the tissue most affected. A large number of the vegetable tonics have one common characteristic, they are bitter to the taste. The physiologic research on the action of drugs is gradually making clear how each medicine acts and is causing a rearrangement of the classification. Hydrochloric, nitric, phosphoric acids, salts of iron, zinc and silver, quinine, gentian, quassia, and strychnine are tonics. Syrup of iron, quinine and strychnine is a much used tonic.

Tonic Sol-fa. Method of teaching vocal music, and notation used therein; based on the principle of key relationship. The names of the notes in the scale indicate relations only, not absolute pitches. To enforce this the ordinary staff notation is set aside in favor of the old syllables used in SOLMIZATION (q.v.), except that they are spelled in English and "si" is changed to "te" and "sol" to "soh" (Doh, Ray, Me, Fah, Soh, Lah, Te, Doh). These syllables are indicated by their initials. The system is most extensively used in England and Wales.

It was originated by Elizabeth Glover in Norwich, and developed by John Curwen. A college in London is devoted to instruction in this system.

Tonk. Town of n. India, near the Banas. Pop., 1891, 46,069.

Tonka (or TONQUIN) **Bean.** *Dipteryx odorata.* Large tree of the natural family *Leguminosæ*, native of n. S. America, bearing fragrant oval seeds, used in perfumery.

Tonka Bean.

Tonnage. Internal measurement of a ship, representing the capacity of the vessel to carry cargo; determined by a mode of measurement prescribed by law; not synonymous with the number of tons she may carry. It is made for the purpose of registry at her port and for the laying of dues. Tonnage is estimated by bulk or by weight. See TON.

Tonnage and Poundage. Ancient tariff on imports and exports, the proceeds of which were used in maintaining the navy. It was levied by all the early sovereigns of England. In the time of Edward I., 1303, all foreign merchants, trading in English ports, had to pay a duty of 2 shillings per tun on imported wine and 3 shillings per pound sterling on all other imported and exported merchandise.

Tonnage Dues. Duty imposed on vessels in proportion to their capacity as a fee for the privilege of using the harbors. It is of ancient origin, being in earlier times collected each time a vessel entered a harbor, but now, an annual tax calculated upon the vessel's registered tonnage. U. S. vessels in foreign trade pay annually 30 cts. per ton to the government; foreign vessels pay in addition 50 cts. light-money; ships built in the U. S., owned partly or wholly by foreigners, pay double rates. In 1886 the U. S. abolished all such duties on ships of those nations who would reciprocate; Germany, the Netherlands and Central American countries only have consented.

Tonometer. Instrument devised by Scheibler and constructed by Koenig, consisting of a set of 65 tuning-forks, such that any two consecutive ones differ four beats per second, and therefore differ in pitch by four vibrations per second. The lowest of the series makes 250 vibrations, the highest 512. Thus any note within the range can have its vibration frequency directly determined, and notes outside the compass may be studied by proceeding by octaves. By the aid of the tonometer a piano or other musical instrument may be tuned to any desired system of temperament.

Tonquin, or TONGKING. Region s. of China and e. of Burmah and Siam; held by France since 1884. Area ab.34,700 sq. m., pop. ab.9,000,000. See ANNAM.

Tonquin, GULF OF. Arm of the China Sea, extending into Tonquin and s. China.

Tonsils. Two almond-shaped bodies situated at the entrance of the throat, one on either side, as one looks into the mouth. They are compound lymphatic glands, and are liable to various diseases. In young children they are frequently found to be so greatly enlarged as to interfere with respiration, which, when accompanied by enlarged adenoid bodies in the naso-pharynx, produce a condition of danger, if not to life, at least to the healthy development of the child. The treatment is surgical.

Tonsilitis. Inflammation of the tonsils, of which there are several forms, of which follicular tonsilitis involves the follicles, and is characterized by the presence of white spots, which are sometimes confounded with diphtheretic patches and vice versa. The disease is a slight one. Suppurative tonsilitis is QUINSY (q.v.).

Tonson, JACOB, 1656–1736. London publisher of many important works and editions.

Tonsure. R. C. usage of shaving the crown of the head, as a preparation for orders. The Irish priests anciently shaved the front of the head and the Greeks and Orientals the whole head.

Tontine. System of annuities or insurance, in which all subscribers pay an equal amount, but the survivors after the death of each member receive an increased annuity or are credited with a corresponding amount on their premiums.

Tonty, or **Tonti,** HENRI, CHEVALIER DE, ab.1650–1704. Italian-French explorer, who came to Canada with La Salle 1678, followed him to the mouth of the Mississippi 1686, and died at the site of Mobile.—His father, LORENZO, devised the Tontine system 1653.

Tooke, JOHN HORNE (orig. HORNE), 1736–1812. English liberal, in orders 1760–73; associated with Wilkes 1765–71; imprisoned for alleged libel 1777–78; tried for treason 1794; M.P. 1801. His *Diversions of Purley*, 1786–1805, is still valued.

Tooke, WILLIAM, 1744–1820. English writer on Russia.—His son, THOMAS, 1774–1858, wrote much on political economy. *History of Prices*, 6 vols., 1838–57.

Toole, JOHN LAWRENCE, b.1832. English comedian, manager since 1879.

Toombs, ROBERT, 1810–1885. M.C. from Ga. 1845–53; U. S. Senator 1853–61; eminent champion of State rights and secession; brig.-gen. C.S.A. 1861–62; in exile 1865–67; vehement opponent of reconstruction; advocate of State taxation of railroads 1874–78.

Tootel, HUGH. See DODD, CHARLES.

Tooth. In Botany, sharp-pointed projection from the margin of a leaf, petal, or other organ.

Tooth. See TEETH.

Toothache. Neuralgic pain in a tooth caused by pressure upon a nerve, either as the product of inflammatory action or some abnormal growth, as an exostosis, or by an exposure of the nerve to the air. When there is a cavity, plugging it with a piece of absorbent cotton, on which has been placed a little baking soda and 2 or 3 drops of chloroform, will usually give relief.

Toothache-Grass. Pungent grasses of the genus *Clenium;* natives of warm regions.

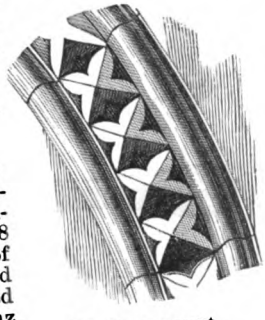
Toothache-Tree. See ASH, PRICKLY.

Tooth-Brushes. The preservation of the teeth was an object of solicitude among many savage tribes. The tooth-brush was preceded by a fragment of soft wood, with which the teeth were rubbed. This custom exists among American Indians and in many parts of the East.

Toothed. See DENTATE.

Toothed Birds. See ODONTORNITHES.

Tooth-Ornament. Form of sculptured enrichment. It was much used in the Early English style, and in France in 12th century.



Tooth-ornament.

Tooth Powder. See DENTIFRICE.

Toothwort. See PEPPER-ROOT.

Top. See TOPS.

Topaz. 1. Oriental; yellow transparent variety of the mineral corundum. 2. Common; anhydrous aluminium silicate, containing ab. 18 per cent of fluorine, $Al_{12}Si_6O_{26}F_{10}$, of lower hardness than corundum, and usually yellow in color, though red and white are not rare. The topaz best for jewelry comes from Brazil and Siberia, but, in specimens of inferior value or as a constituent of rocks, it is a widely distributed mineral. An amorphous variety is found in Sweden, which can be used as an abrasive. 3. False; variety of transparent yellow quartz.

Topazolite. Yellow variety of the mineral GARNET (q.v.).

Top Crossing. Form of line breeding, in which animals of dissimilar character or family are mated, and then upon the offspring is used a sire of the same character as the first one; particularly successful when a pure-bred sire is used upon native or grade females.

Tope. Buddhist mound for the preservation of relics or the commemoration of some event. In the former case it is called a dagoba and in the latter a stupa. They are built of more or less solid masonry, and are surrounded by an elaborately carved railing with gateway. The chief one, at Sanchi, Central India, is 42 ft. high and 106 ft. in diameter.

Topeka. Capital of Shawnee co., Kan., and of the State since 1861; on the Kansas River; settled 1854, chartered 1857; seat of Washburn Coll. (Cong.) and that of the Sisters of Bethany (P. E.). It has 120 m. of streets, a capitol building

which cost $2,000,000, and some manufactures. Pop., 1890, 31,007.

Topelius, ZACHARIAS, b.1818. Finnish poet, dramatist, and writer of juvenile and other tales; ed. *Tidningar* 1842–60; prof. Helsingfors 1854–78. *Surgeon's Stories*, 6 vols., 1872–74.

Topete, JUAN BAUTISTA, b.1821. Spanish admiral 1867; Sec. Navy 1868, 1870, and 1874.

Töpffer, RUDOLF, 1799–1846. Swiss novelist; prof. Geneva 1832.

Tophet. In O. T., (1) garden in the Valley of Hinnom, s.e. of Jerusalem; (2) from the idolatrous orgies held there, symbol of all abominations, and of divine retribution attending them. See GEHENNA.

Toplady, AUGUSTUS MONTAGUE, 1740–1778. English sacred poet; extreme Calvinist and fierce polemic, especially against the Wesleys. His *Works*, 6 vols., 1794, afford less cheerful reading than his hymns, collected 1860, including "Rock of Ages," 1776.

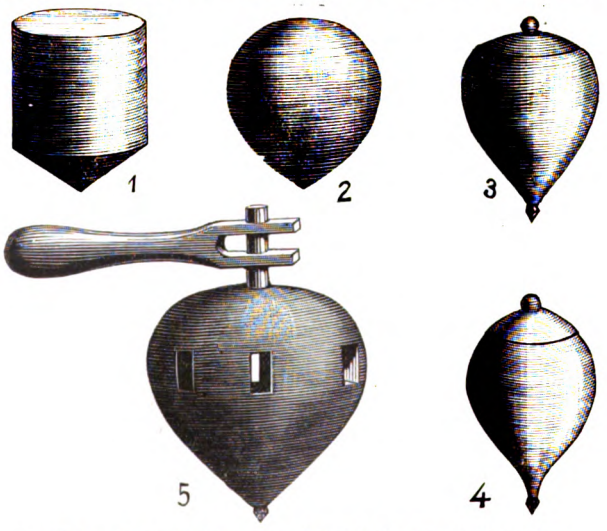
Topography. Details of relief of the earth's surface, as distinguished from orography, which includes the grand features of relief; natural surface of a country, represented on a map by means of symbols. Elevations are represented by contour lines, or by lines running down the declivities; streams and streets are shown by curved and straight lines, forests and plains by symbols which have a rough resemblance to trees and grass, and water by wavy lines parallel to the shores.

Topolias. Modern name for LAKE COPAIS (q.v.).

Topolobampo Bay. On n.w. coast of Mexico; part of Gulf of Cal. An unsuccessful Socialist colony was planted here 1886.

Toponeura. See SCYPHOMEDUSÆ.

Tops. These familiar and universal toys are of two principal kinds, peg-top and humming-top. Both are known to savage and primitive people, and specimens of the former exist in America and Egypt from remote antiquity. The origin and precise significance of tops is unknown. They are invariably regarded as a toy for boys, and are associated with the season of ice and winter. They exist in the greatest complexity and variety of forms in Japan. Over twenty kinds of



1, 2, Whip-tops; 3, Peg-top; 4, Spanish Peg-top; 5, Humming-top and Fork.

Japanese tops have been described, of which one of the most primitive is made of the tip of a conch shell weighted with lead, which is spun on a mat and used in a kind of gambling. Peg-top is played by any number, the object being to drive tops out of a ring by striking them with the one which the player throws, which must spin unless a top be knocked out. Other varieties are Spanish peg-top, humming-top, and whip-top, which was known in Virgil's time.

Topsöe, VILHELM CHRISTIAN SIGURD, b.1840. Danish novelist and descriptive writer. *Jason*, 1875; *Tales*, 1890–91.

Torbanehill. See TORBANITE.

Torbanite. BOGHEAD COAL (q.v.) from Torbanehill, Scotland.

Torbernite. Rare mineral, hydrous uranium phosphate of complex composition and beautiful green color, sometimes called uranium mica.

Torbert, ALFRED THOMAS ARCHIMEDES, U.S.A., 1833–1880. Brig.-gen. U. S. Vols. 1862–66; Minister to San Salvador 1869–71; Consul-gen. at Havana 1871–73, and Paris 1873–78.

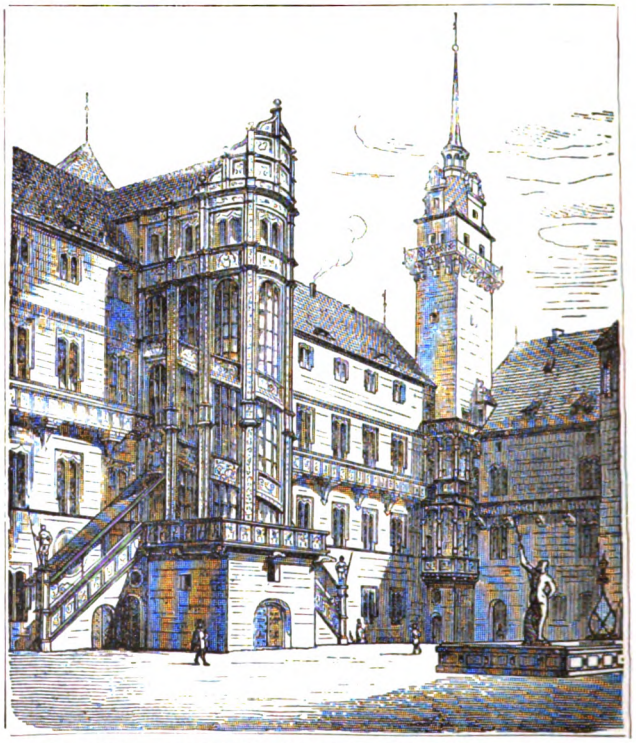
Torch Wood. *Amyris floridana.* Florida shrub having a resinous juice; much used for fuel on the Florida Keys.

Tordesillas, CONVENTION OF. Held at Tordesillas, Spain; here the treaty between Spain and Portugal was signed, June 7, 1494, in which it was agreed that the divisional meridian, relating to the rights of conquest of the two nations, should be 370 leagues w. of the Cape Verde islands; Spain to have the right of conquest w. of this line and Portugal that to the e. The vagueness of the terms of the treaty led to disputes.

Toreno, JOSÉ MARIA QUEIPO DE LLANO RUIZ DE SARAVIA, COUNT, 1786–1843. Spanish historian and official, repeatedly in exile. *War of Revolution*, 5 vols., 1835–37.

Torfason, or **Torfaeus,** THORMODR, 1636–1719. Icelandic scholar; historian of ancient Vinland and Greenland, 1705–6, and of the Danish and Norwegian kings, 1702–11.

Torgau. Town of Prussian Saxony, on the Elbe. Here, Nov. 3, 1760, the Austrians under Daun were routed by Fred-



East Wing of the Castle at Torgau. Rebuilt from 1532–36.

erick II. It has a castle (Hartensfels) used as a barracks and military prison. It has an extensive trade in gloves, pottery and mineral waters. Pop., 1890, 10,988.

Toribio, ST., (T. ALFONSO MONGROVEJO), 1538–1606. Abp. of Lima from 1581; protector of the natives; eminent for charity and devotion; beatified 1679, canonized 1726.

Torices, MANUEL RODRIGUEZ, 1788–1816. Pres. of Colombia 1812–14; defeated and executed by the Spaniards.

Tories. 1. Irish R. C. outlaws, ab. 1650–80. 2. Stiff adherents of Charles II. and James II. 3. English party, opposed to all changes in the State, supporters of privilege; called Conservatives since 1830. 4. American opponents of the Revolution, 1775–82.

Torii. Construction of bronze, stone or wood, consisting of two pillars, joined at the top by two cross-bars, projecting at both ends with an upward curve, and placed in front of every Shinto shrine in Japan; a perch for sacred fowls, who gave warning of daybreak.

Tornado. Violent storm of wind, usually destructive. Those of w. coast of Africa are said to form suddenly in a clear sky; those of America and India are characterized by

a horizontal and ascending whirl and the formation of a central cloud, extending from near the earth up to the main cloud, where the storm has its origin. In those observed by Bellamy on the upper Niger the central funnel-shaped cloud was absent.

Tornaria. See BALANOGLOSSUS.

Tornea. River of Finland, flowing s., into Gulf of Finland, forming the greater part of the Finnish-Norwegian frontier. Length 230 m.

Toronto. Capital of Ontario, Canada; near the head of Lake Ontario; settled, as York, 1794; twice burned by Americans 1812; chartered 1834. It has an excellent harbor and considerable commerce. Its university, founded 1829, burned 1890, has ab. 22 instructors and 400 students, besides several affiliated colleges of divinity and law. Pop., 1891, 181,220, chiefly of recent growth.

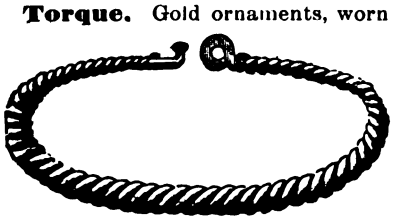
Torpedo. Apparatus containing explosives, which can be set off under water by contact with a vessel, thus exploding a percussion cap, which detonates the dry cotton and this the wet cotton. Sometimes they are stationary, or they may be automobile, and propelled through the water by electric or other motors attached to them. In 1585, at the siege of Antwerp, a bridge was destroyed by a floating mine. Submarine boats were used in the Revolution. In the Civil War torpedoes were used by both sides. The Whitehead torpedo was developed by Robert Whitehead, and dates from 1864; it is a cigar-shaped steel tube, 18 in. diameter, charged with 250 lbs. of guncotton, with 12 per cent moisture, and a dry guncotton detonator of 16 oz. Its propeller is driven by compressed air 900 yds., at a speed of 30 knots. The Howell torpedo has an internal fly-wheel, which is spun up to 10,000 revolutions per minute before launching, which acts upon the propeller. The torpedoes are launched from the tubes by compressed air or a small charge of gunpowder.

Torpedo. See RAYS.

Torpedo Vessels. Torpedo supply vessels are intended to transport small torpedo boats, torpedoes and submarine mines, and are provided with machinery for ordinary repairs. They are ab. 350 ft. long, 60 ft. beam, 20 ft. draught, 6,000 tons measurement, and a speed of 20 knots. They are armed with rapid-fire guns and automobile torpedoes. Torpedo vessels are used for defense of ports against torpedo boats, and are also sea-going. They are ab. 250 ft. long, 30 ft. beam, 10 ft. draught, 1,000 tons measurement, and a speed of 20 knots. They are armed with rapid-fire guns, 4 launching tubes, and 18 in. Whitehead torpedoes. Torpedo-boat destroyers are ab. 180 ft. long, 18½ ft. beam, 6 ft. draught, and a speed of 30 knots. They are armed with 3 launching tubes for 18 in. Whitehead torpedoes, and rapid-fire guns. First and second-class torpedo boats are used for defense of ports. These are 100 tons and 50 tons measurement, and armed with 3 launching tubes for 18 in. Whitehead torpedoes, and rapid-fire guns. First-class are 140 ft. long, 15½ ft. beam, 5½ ft. draught, 100 tons measurement, and a speed of 24 knots. Third-class torpedo boats are carried on torpedo supply vessels or on battleships, from which they are removed when required. Those of the U. S. are 58 ft. long, 9 ft. beam, 15 tons measurement, and a speed of 18 knots. They have one 1½ in. rapid-fire gun and one launching tube for 18 in. Whitehead torpedoes. See SUBMARINE BOATS.

Torquatus, TITUS MANLIUS. Dictator 353 B.C., Consul 347. Of the celebrated patrician family of ancient Rome. He had his son killed because he killed a Latin warrior in single combat, which was contrary to his orders; hence the expression Manliana imperia.

Torque. Gold ornaments, worn around the neck or arm in ancient times in Asia and Europe, found in Gt. Britain, Ireland and France. These ornaments seem to have formed an important part of the wealth of those times.



Torque.

Torquemada, JUAN DE. 1388–1468. Spanish Dominican, active at the Councils of Basel and Florence; Cardinal 1439, Bp. of Palestrina 1455; theological writer.

Torquemada, JUAN DE, ab.1550–ab.1625. Provincial of Franciscans in Mexico 1614. *Monarquia Indiana*, 1615.

Torquemada, TOMAS DE, 1420–1498. Spanish Dominican, Inquisitor-gen. of Castile and Aragon 1483; infamous as a persecutor. He brought thousands to the stake, and promoted the expulsion of the Jews 1492.

Torrelli, ACHILLE, b. 1844. Neapolitan dramatist and poet.

Torrens, LAKE. In S. Australia, 90 m. n. of Spencer Gulf: salt marsh or shallow lake, ab. 125 m. by 20, with no outlet.

Torrens, ROBERT, 1780–1864. Irish officer, M.P., and writer on trade and finance.

Torrens, WILLIAM (MCCULLAGH), 1813–1894. M.P. 1848–52 and 1865–70; reformer; biographer of R. L. Shiel, 1855, and Sir J. Graham, 1863. *Industrial History*, 1846; *Our Empire in Asia*, 1872.

Torrens System OF LAND REGISTRY. Devised ab.1850 by Robert R. Torrens (1814–1884) of Adelaide; adopted 1858 in S. Australia, and subsequently in most of the larger British colonies. It consists of a special form of official registry of the title to land, as distinct from the deed, on each occasion of transfer. The government examines, registers, certifies, and guarantees titles for a small fee.

Torres, CAMILLO, 1766–1816. Colombian jurist and patriot, supreme chief 1815–16; executed by the Spaniards.

Torres Strait. Between Australia and New Guinea; 80 m. wide.

Torres Vedras, LINES OF. Series of defensive works, 152 in all, in three lines from Lisbon ab.25 m. n., constructed by Wellington to resist the advance of the French. The allies fell back within these fortifications Oct. 1810: the invaders withdrew March 1811.

Torres y Ayala, LAUREANO, 1645–1722. Gov.-gen. of Cuba 1707–11 and 1713–16.

Torres y Rueda, MARCOS DE, 1591–1649. Bp. of Yucatan 1644; Gov. of Mexico 1648; author of a notable auto-da-fé 1649.

Torre-Tagle, JOSÉ BERNARDO, MARQUIS DE, 1779–1825. Pres. of Peru 1823; deposed 1824.

Torrey, BRADFORD, b.1843. American ornithologist and magazinist.

Torrey, CHARLES TURNER, 1813–1846. Anti-slavery martyr, imprisoned in Baltimore from 1844. *Home*, 1846.

Torrey, JOHN, M.D., LL.D., 1796–1873. Prof. Princeton 1830–54, and Columbia 1860–73; very eminent botanist. *Flora of Northern and Middle States*, 1826; *N. American Cyperaceæ*, 1836; *Flora of N. America*, with Asa Gray (incomplete), 1838–43; *Flora of New York*, 1843.

Torrey, JOSEPH, D.D., 1797–1867. Prof. Univ. Vt. from 1827; pres. 1862–66; tr. Neander's *Ch. History*, 1854. *Theory of Art*, 1874.

Torrey, JOSEPH WILLIAM, 1828–1884. Journalist in Boston and Hong Kong; Vice-consul in Siam; founder of a trading company in Borneo 1864; Rajah of Amboy 1865–79; Sec. U. S. legation in Siam 1879–83.

Torricelli, EVANGELISTA. 1608–1647. Italian mathematician and physicist; prof. Florence 1642. He wrote on the quadrature of the cycloid and conics. His works were collected 1644.

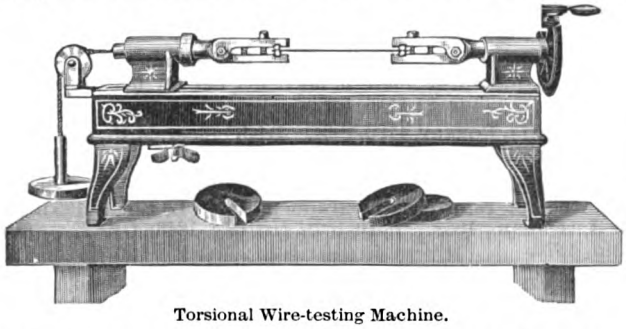
Torricellian Vacuum. If a vessel be filled with any liquid having a density ρ, and then inverted, so that its mouth is below the surface of the liquid in another vessel, the difference of level in the two vessels will be $\frac{P}{\rho g}$, in which P is the pressure of the air at the time, and g the force of gravity. The space above the liquid in the closed vessel will contain nothing but the vapor of the liquid. Torricelli first produced this vacuum 1643, using water in tubes 60 and 40 ft. long, attached to the sails or arms of a windmill.

Torricelli's Law. Theorem first stated 1644. 1. The speed with which a liquid issues from an orifice is the same as that which would be produced in the mass by falling freely from the same height. 2. This speed is directly proportional to the square root of the head, or depth of the orifice below the surface. 3. Since the speed of efflux is independent of the particular liquid used, all liquids issue under the same head with the same speed. See EFFUSION.

Torrigiano, PIETRO, 1470–1522. Italian sculptor, victim of the Spanish Inquisition.

Torrubia, JOSÉ, ab.1695–1768. Spanish naturalist and traveler.

Torsion. Twisting of a bar or shaft by an applied force acting at the end of a lever. The stresses developed in torsion



Torsional Wire-testing Machine.

are mostly those of shearing. The strength of a shaft is proportional to the cube of its diameter.

Torsion Balance. See COULOMB'S TORSION BALANCE.

Torstensson, LENNART, 1603–1651. Swedish commander of artillery in the battle of the Lech, April 5, 1632; Commander-in-chief in Germany 1641.

Tort. Unlawful invasion of a legal right not originating in contract; to be redressed by a common-law action. The same act may be a crime as well as a tort, as in the case of an assault and battery.

Tortoises. See CHELONIA.

Tortoise Shell. Scales of the carapace of the hawk's-bill turtles. They are used for making combs, toilet articles, and inlaying. It is easily worked, as under the influence of a gentle heat it can be molded into any shape desired and even can be welded. See CHELONIADÆ.

Tortola. Largest of the Virgin Islands, W. Indies, belonging to Gt. Britain since 1666; 11 m. by 4 m.; area 24 sq. m.

Tortricidæ. See COLUBRIFORMIA.

Tortuga. Island n. of Haiti, once headquarters of buccaneers. Area 80 sq. m.

Tortugas, DRY. Group of keys, or low islets, 120 m. w.s.w. from the s. extremity of Florida, to which they belong. On one of them, during the Civil War, Fort Jefferson was established and used as a military prison.

Tortuosity. Distinctive property of a curve in virtue of which it is called tortuous, or a curve of double curvature. The various points of such a curve do not all lie in one plane; *e.g.*, a helix.

Torture. Regarded by the Athenians as an important means of eliciting truth both from the accused and from witnesses, if slaves, and apparently also from foreigners; freemen were by special law exempt. This enforced testimony seems to have been preferred to that of citizens when freely given. In the Roman republic it was applied to witnesses and suspected persons (not freemen); but slaves might not be tortured to prove the guilt of their master, except in case of crimes against the gods, and, later, of adultery and crimes against the State. Under the emperors free persons, sometimes even knights and senators, were tortured to extract evidence in State cases. Christians of all ranks were subject to torture while Diocletian's edict was in force, 303–311. A wife could be tortured if accused of poisoning her husband; a freeman if there were inconsistencies in his testimony; but priests, pregnant women, and children under 14 were exempt. Torture was employed also in the punishment of criminals. The means used were the rack, barbed hooks, cords to compress the arm, and leaden balls attached to a thong. Crucifixion, mutilation, exposure to wild beasts, and other cruel modes of death were common, especially in the persecutions. Crucifixion was abolished by Constantine 315; mutilation was limited to loss of one hand by Justinian; slaves were scourged, adulterers also. By the Theodosian code heretics were to be flogged with lead before banishment; insult to a bishop or priest in church was punished by torture and exile. In the Middle Ages, wherever legislation was based on the Roman law, torture was adopted also. It was most elaborately systematized and minutely developed in Italy. As late as 1769 the Criminal Code of Maria Theresa illustrated the various methods by 45

Estrapade or Question Extraordinary.

Water Torture.

large plates of engravings. Torture was never legalized in England, though practiced there from before 1188 to 1640; it was generally inflicted by special order. The rack in the Tower of London was introduced in the reign of Henry VI., and often employed in those of Henry VIII., Mary, and especially Elizabeth. The PEINE FORTE ET DURE (q.v.) allowed by the common law differed from it, however, only in name. This was employed once for refusal to plead in a trial for witchcraft in Salem 1692, and was used in England as late as 1726, but was abolished in 1772. The Inquisition applied the principles of the Roman law to the punishment of heretics, regarding heresy as a sort of treason against God and the Church. In 1252 Pope Innocent IV. issued a bull directing the secular powers to torture persons suspected of heresy. From the Spanish reorganization of the Inquisition in 1480, the Holy Office made free use of fire, water, melted metals, mutilation, the thumb-screw, the Spanish boot, and other ingenious devices to compel confession. Torture was abolished in Scotland 1708, in Portugal 1776, in Sweden 1786, in France 1789, in Germany ab. 1800. Various instruments of torture are shown to-day in the town-house of Ratisbon, and in the Tower of London. Few jurists have attempted to justify the use of torture.

Toru Dutt. See DUTT.

Torula Cerevisiæ. Name first given to the yeast-plant. See FERMENT.

Torus. End of the peduncle of a flower, on which all

the floral parts are borne; called also the Receptacle or Thalamus.

Torus. In Classical Architecture, large molding, semicircular in section, used in the bases of columns. The ASTRAGAL (q.v.) is much smaller.

Tory. See TORIES.

Tosariu. Japanese school of painting, which flourished ab.1200, least affected by Chinese influence. It deals mostly with historical and mythological subjects.

Toschi, PAOLO, 1788–1854. Italian engraver, who reproduced many works of the Old Masters, and of modern artists. Among his finest works are: *Descent from the Cross, Repose in Egypt*, and *Venus and Adonis.*

Tosti, FRANCESCO PALO, b.1846. Italian composer of songs, in England since 1880.

Total Abstinence. See ABSTINENCE.

Total Benefit OF A MONOPOLY. Net benefits accruing to producers and consumers together from the sale of a monopolized commodity; made up of the sum of the monopoly revenue and the consumers' rent.

Total Cost. Sum of the prime cost of an article and of its supplementary cost; *i.e.*, its share in the general expenses of the business.

Total Differential OF A FUNCTION OF TWO OR MORE VARIABLES. That arising from the simultaneous change in all the variables; sum of the partial differentials.

Total Reflection. See REFLECTION and CRITICAL ANGLE.

Total Refraction. When the plane of polarization of a beam of plane polarized light is perpendicular to its plane of incidence, and the angle of incidence is equal to the polarizing angle, no light will be reflected from the surface of a transparent medium, and we have a case of total refraction, in which the incident angle and the refracting angle are complements.

Totem. Class of objects closely and peculiarly related to clans, sexes, or individuals; often tattooed or printed on the person; *e.g.*, a snake, crow, or tree. This is tabooed, may not be killed or eaten, sometimes may not be touched or looked at. Some tribes think themselves to be descended from their totem.

Totem in Alaska.

Persons of the same totem are bound to mutual protection, and may not intermarry. Totemism is a sort of religion, and prevails in many parts of N. and S. America, Africa, Asia, and the islands, and may be traced among the ancient Egyptians. See TATTOOING.

Totila, d.552. Ostrogothic king 542. He took Rome 546, and ruled much of Italy.

Totipalmatæ. See STEGANOPODES.

Totipalmate. See STEGANI.

Totten, BENJAMIN J., U.S.N., 1806–1877. Commodore 1867. *Naval Text-book*, 1841–62.

Totten, JOSEPH GILBERT, U.S.A., 1788–1864. Col. and chief engineer 1838; Brig.-gen. 1863. His work was chiefly on harbors and ports.

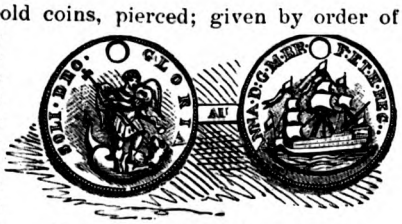
Toucans (RHAMPHASTIDÆ). Scansorial birds of the American tropics (but not W. Indies), noted for their enormous but light bills, the walls of which average $\frac{1}{30}$ in.; the interior is spongy, filled with air, admitted from an antorbital chamber of the skull. The tongue is horny, slender, and brush-like; their considerable tails are hinged next the pelvis, so that they can throw them over their backs when resting, where the bills lie also during sleep. They are omnivorous, but prefer fruit, live in flocks in forests, and nest in hollow trees. There are over 50 species, in size from that of a robin to a crow, and colored from green to black, variegated with red, yellow and white. The largest is 2 ft. long, with bill 8 in. long and 3 in. high. The group is related to Woodpeckers and Parrots.

Toucey, ISAAC, 1796–1869. M.C. 1835–39; Gov. of Conn. 1846–47; U. S. Atty.-gen. 1848–49; U. S. Senator 1852–57; Sec. Navy 1857–61.

Touch, SENSATIONS OF. Changes of consciousness aroused by stimuli of contact or pressure upon the surface of the body. Touch is one of the skin senses, and must be distinguished from the TEMPERATURE (q.v.) sense. The fineness of the tactile sense varies greatly in different regions of the body (see SENSATION AREAS). The end organs of touch or pressure are small modified nerve-endings, known as corpuscles of various kinds, situated in the skin and directly connected with the great sensory nerves.

Touch-me-not. See JEWEL-WEED.

Touch-Money. Gold coins, pierced; given by order of Charles II. to persons touched by him, to be healed of King's Evil (scrofula). As 92,107 persons came 1661–82, and each received a gold coin, it became necessary to limit the patients to those who obtained a certificate from their parish minister. Specimens of the money are in many numismatic collections.



Touch-piece (time of Queen Anne).

Touch Paper. Paper steeped in saltpeter and dried. It ignites slowly and burns in sparks. Sometimes burned in a room to relieve asthma paroxysms. See MATCH.

Touchstone. See BASANITE.

Touchwood. Fungus (*Polyporus igniarius*) growing on trees; that which grows on the oak is most esteemed: also, the wood of the ash or willow which has undergone dry rot. It is much improved by wetting with potassium nitrate or chloride; used for tinder. See AMADOU.

Tougaloo University. Founded 1869 in Madison co., Miss., by American Missionary Association; for colored persons. It has 8 departments, 23 teachers, and nearly 400 students.

Toulmin, JOSHUA, 1740–1815. Unitarian pastor at Birmingham from 1804; biographer of Socinus, 1777. *Internal Evidences*, 1785; *Dissenters under William*, 1814.—His son, HENRY, 1767–1823, was pres. of Transylvania Univ. 1794–96, Sec. of State of Ky. 1796–1804, and U. S. District Judge for Miss. 1804. *Acts of Ky.*, 1802; *Laws of Ala.*, 1823.

Toulon. Fortified seaport and naval station of s. France, on the Mediterranean; scene of English defeats 1707 and 1744. In 1793 they held the town four months, and were expelled by Bonaparte. Pop., 1891, 74,144.

Toulouse. Ancient city of s. France, on the Garonne; capital of the Visigoths 412, of dukes of Aquitaine 611–761, and of its counts ab.920–1271; long center of Provençal culture; harried in Albigensian crusade (see RAYMOND). Its university was founded 1229. Its cathedral dates from 1096, but is mostly of later erection. The town has other old buildings, and extended commerce and manufactures. Here the British under Wellington defeated a French army under Soult, April 10, 1814. Pop., 1891, 149,791.

Tour, CHARLES AMADOR DE ST. ÉTIENNE, SIEUR DE LA, d. ab.1665. Commandant of Fort St. Louis at Cape Sable, Nova Scotia, 1630, where he repelled an attack by his father,

then in the English service; Lieut.-gen. of Acadia 1631, 1638, and 1648; at war 1641–45 with De Charnisé, whose widow he married 1653. His first wife was celebrated by Mrs. Catherwood in *The Lady of Fort St. John*, 1891.

Touraine. Old province of central France; annexed 1204.

Tourbillon. Rotating mass of fluid, whether of eddies in water or whirlwinds in the atmosphere; with some writers, American tornado.

Tourcoing. Manufacturing town of n. France, 10 m. n.e. of Lille. Pop., 1891, 65,477.

Tourgee, ALBION WINEGAR, b.1838. Judge N. C. Superior Court 1868–74; U. S. Consul at Bordeaux 1897. His novels, *A Fool's Errand*, 1879, *Bricks Without Straw*, 1880, and *Hot Plowshares*, 1883, deal with the South after the war. *War of the Standards*, 1896.

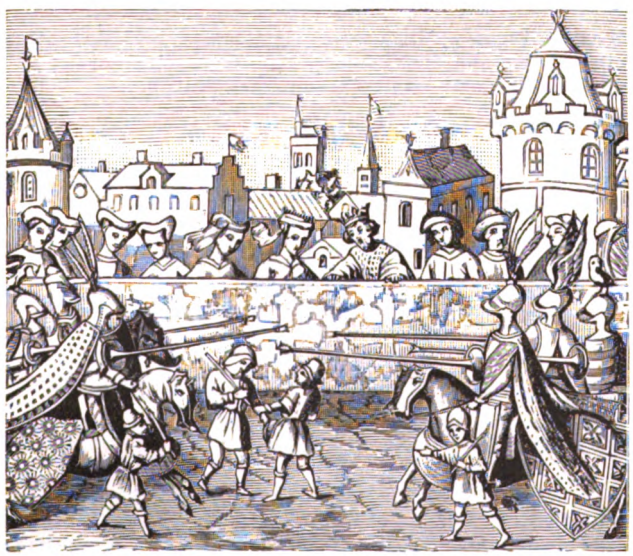
Tourjee, EBEN, b.1834. Founder of musical conservatories in R. I. and Boston; compiler of tune-books.

Tourmaline. Mineral of complex and variable chemical composition, and of wide range of color, though constant in hardness and crystalline form. It is a silicate, containing aluminium and boron, with one or more of the elements, magnesium, iron, calcium, sodium, potassium, and lithium. The clear-colored transparent varieties are prized as gems, or find use in optical experiments in the polarization of light. The common black variety is of no special value. It is found especially at Mt. Mica, Paris, Me.

Tourmaline Pincette. Small apparatus for producing and studying polarized light. It consists of two tourmalines cut parallel to the crystallographic axis, each fitted in a circular frame fastened to a spring, bent so as to form a handle and at the same time keep the disks in contact with each other. One of the tourmalines may be made to rotate relatively to the other, and so their axes may be placed either perpendicular or parallel to each other, thus intercepting or transmitting the polarized beam.

Tourmaline Tongs.

Tournament, or TOURNEY. Encounter of armed knights on horseback; public exhibition of skill and prowess, held usually on the invitation of some prince, and conducted under



Tournaments in honor of the entry of Queen Isabel into Paris.

strict rules; institution of the Middle Ages, which ended 1559 in France, with the death of Henry II. from an accident in the tilt. See JOUST.

Tournefort, JOSEPH PITTON DE, 1656–1708. Prof. Paris 1683. French botanist. *Elemens de botanique*, 1694; *Histoire des plantes*, 1698; *Institutiones rei herbariæ*, 1719; *Traité de la matière médicale*, 1717.

Tourneur, CYRIL, d.1626. English dramatist and poet. *Revenger's Tragedy*, 1607; *Atheist's Tragedy*, 1611.

Tourniquet. Instrument to control the circulation of the blood by means of compression, used chiefly to prevent loss of blood during an operation or after a wound involving an artery. It can be extemporized by using a handkerchief, in which a knot has been tied to be placed over the artery, tied loosely around the limb and twisted by a stick until sufficient compression is produced: this is known as the Spanish Windlass.

Touro, JUDAH, 1775–1854. Jewish philanthropist of New Orleans.

Tours. City of France, on the Loire, near the mouth of the Cher. It has large manufactures, especially of silks, though much less than before 1685. Near it Charles Martel defeated the Saracens 732. It was the ancient capital of the Turones, long of Touraine, and the seat of French government Sept.–Dec. 1870. Pop., 1891, 60,335.

Tours, BERTHOLD, b.1838. Dutch composer, in England since 1861.

Tourville, ANNE HILARION DE COTENTIN, COMTE DE, 1642–1701. French admiral 1689; victorious over English and Dutch

Tourville.

fleets in the Channel 1690, and near s.w. Portugal 1693; defeated off Cape La Hogue May 19–24, 1692.

Tousey, SINCLAIR, 1818–1887. Founder and pres. American News Co. 1864.

Toussaint, DIEUDONNÉ GABRIEL, 1717–1799. Prof. of Botany at Prague 1760; traveler in America. *Prodromus Floræ Mexicanæ*, 4 vols., 1773–77; *Bibliotheca botanic*, 1779.

Toussaint, FRANCOIS DOMINIQUE (L'OUVERTURE), 1743–1803. Haitian slave; Brig.-gen. 1794; Commander-in-chief 1796. He accepted the proposals of the French Republic, and by successful operations against the Spanish and English reduced n. Haiti to the control of France; suppressed the insurrection of Rigaud 1797; sent the French Commissioner home for favoring the slave trade; assumed the civil government in name of the Directory Nov. 1800, and ruled with skill and success for a time. In Nov. 1801, Napoleon sent 66 warships and 30,000 veterans to Haiti. T. defended himself for some months in the mountains, but surrendered on assurances of personal immunity and the liberty of the negroes; was seized, and taken to France, where he died.

Tow. Waste fibers after the carding of flax and hemp, which are made into bags and yarn. Some kinds are called codilla.

Tower, CHARLEMAGNE, LL.D., b. 1848 in Phila. U. S. Minister to Austria 1897. *Lafayette in American Revolution*, 1895.

Tower, ZEALOUS BATES, U.S.A., b.1819. Major of engineers 1861; Brig.-gen. U. S. Vols. 1861–66, serving in Va. and the West; engaged on harbor defenses till 1883; Col. 1874.

Tower. See BELFRY, CAMPANILE, KEEP, LEANING TOWERS, ROUND TOWERS, ROOD TOWER, SPIRE, STEEPLE, and the various articles on the different styles of Architecture.

Tower Bridge. Over the Thames in London; built in 1893; having two high towers with a permanent roadway con-

necting their tops, while a lower roadway on the level of the street can be opened to allow the passage of vessels. Its length

Tower Bridge.

is 940 ft., the span between towers 200 ft., and the height of the upper roadway above the water 135 ft. Access to the upper footway is furnished by elevators in the towers.

Tower Hamlets. Parliamentary borough in e. London, comprising 7 divisions; namely, Whitechapel, St. George, Limehouse, Bow and Bromley, Poplar, Mile End, and Stepney. Originally they were outside the jurisdiction of London. Pop. 451,900.

Tower-Mustard. *Arabis glabra.* Herb of the natural family *Cruciferæ*, native of the n. temperate zone.

Tower of London. See LONDON, TOWER OF.

Towers of Silence. At Bombay, and elsewhere in India and Persia; used by the Parsees for the disposition of dead bodies; 20 to 30 ft. high and 60 to 90 ft. in diameter. As the burial or burning of the body would corrupt the elements, it is placed where vultures strip the flesh from the bones. See DISPOSAL OF THE DEAD.

Towianski, ANDREAS, 1799–1878. Polish enthusiast, revered as a prophet and Messiah by Mickiewicz and others; driven from Paris 1842, and later from Rome.

Towle, GEORGE MAKEPEACE, 1848–1893. American historical writer. *Heroes of History*, 6 vols., 1878–82.

Towler, JOHN, M.D., b.1811 in England. Prof. Hobart Coll. 1850–82; tr. German poems; writer on photography.

Town. Territorial subdivision of the State. The term is used in many senses. According to Coke, a place could not be a town unless it had had a church. It sometimes designates a thickly settled locality, at others a political subdivision. In the U. S., the meaning often depends upon statutory provisions. In New England it is a township, or division of a county.

Town, SALEM, 1779–1864. American author of schoolbooks. *Derivative Words*, 1830.

Town Council. Governing body of a municipality. See MUNICIPAL CORPORATIONS.

Townley, CHARLES, 1737–1805. English collector of Greek and Roman statues, coins, etc., now in British Museum.

Townley, JAMES, 1774–1833. English Wesleyan. *Illustrations of Biblical Literature*, 1821.

Towns, GEORGE WASHINGTON BONAPARTE, 1801–1854. M.C. 1835–39 and 1845–47; Gov. of Ga. 1847–51.

Townsend, EDWARD DAVIS, U.S.A., b.1817. Col. 1861; chief executive officer of War Dept. 1861–65.

Townsend, EDWARD W., b. 1855. American journalist and author. *Chimmie Fadden*, 1895; *A Daughter of the Tenements*, 1895.

Townsend, GEORGE ALFRED ("GATH"), b.1841. American journalist and novelist. *Tales of the Chesapeake*, 1880; *Katy of Katoctin*, 1886; *Mrs. Reynolds and Hamilton*, 1890.

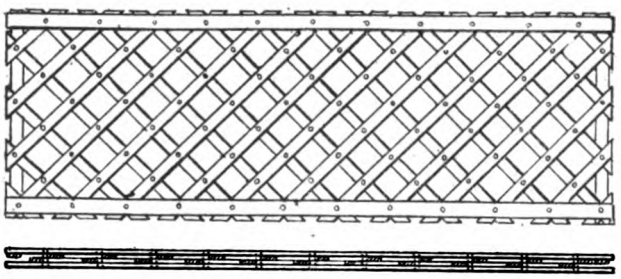
Townsend, LUTHER TRACY, D.D., b.1836. Prof. Boston Univ. 1867–93. *Sword and Garment*, 1871; *Credo*, 1873; *Theology*, 1893.

Townshend, CHARLES, VISCOUNT, 1674–1738. Privy Councilor 1707–12; Envoy to Holland 1709–10; Sec. of State 1714–16 and 1721–30.—His grandson, GEORGE, 1724–1807, became M.P. 1747; was Brig.-gen. in Canada 1759, succeeding Wolfe at Quebec; served in Portugal 1762; was Lord-lieut. of Ireland 1767–72, and was made Marquis 1787.—His brother, CHARLES, 1725–1767, became M.P. 1747, Privy Councilor 1757, Sec. of War 1761, and Chancellor of the Exchequer 1766. He was noted as a wit and orator, had more ability than principle, and brought in the system of colonial taxation which led to the American Revolution.

Townshend, CHAUNCY HARE, 1798–1868. English poet and writer on mesmerism. *Religious Opinions*, 1869.

Township. Division of a county in some American States. See TOWN.

Town Truss. Bridge truss invented 1820 by Ithiel Town, having its chords and webbing made of planks fastened together with treenails. It was used for short spans until ab.1850, but



Town's Bridge.

is now rarely built. The timbers or chords take up the thrust strain and no lateral pressure is exerted against the piers or abutments. The slat pieces are arranged parallel at an angle of 45° to a horizontal line.

Towton. In Yorkshire; site of battle March 29, 1461, fatal to the Lancastrians, of whom more than 37,000 fell.

Toxæmia. Illness produced by poisoning the blood, either by the products of the body-cells that have not been thrown off from the system, or by the toxins due to the growth of mirco-organisms.

Toxicology. Science which investigates the nature of poisons, their effects upon animal life, the method of their detection either from the symptoms or by post mortem examination, and the treatment of the person poisoned.

Toxodon. S. American late Tertiary fossil, 5-toed, ungulate, and as large as a rhinoceros. Its legs and feet were elephant-like; the nasal openings were situated as in *Sirenia:* the incisors were rodent-like, the molars edentate-like, and other parts of the skeleton have rhinocerotic characters.

Toxodontia. Suborder of *Taxeopoda*, comprising certain large extinct Mammals of the Tertiary deposits of S. America. Some forms included here are by certain authors referred to the *Hyracoidea*. Others have affinities with Ungulates, some with Rodents, and others with Edentates. The teeth grow from persistent pulps: the grinders are flat-crowned and crescentic in cross-section, the convexity being outward. There is a wide diastema and small canines. See TOXODON.

Toxoglossa. Group of ctenobranchiate Gastropods, having siphon and a radula furnished with two rows of long hooks. *Conus* is an example.

Toy, CRAWFORD HOWELL, D.D., LL.D., b.1836 in Va. Prof. of Hebrew at Greenville, S. C., and Louisville, Ky., 1869–79, and since 1880 at Harvard. *Religion of Israel*, 1882; *Quotations in N.T.*, 1884; *Judaism and Christianity*, 1890.

Toys. Children's playthings and articles of all sorts designed for amusement to children. France, Germany, and Switzerland are the chief producers. See DOLL.

Toynbee, ARNOLD, 1852–1883. Lay missionary in London. *Industrial Revolution*, 1884. T. Hall, founded 1885 in Whitechapel for the improvement of the poor, and carried on by Oxford and Cambridge men, is his memorial. It has been the model for sundry college settlements and the like in American cities.

Trabeculæ. In Vegetable Anatomy, ducts provided with projections from their walls nearly or entirely across their cavities.

Trabeculæ OF SPONGES. Cross beams of tissue and of spicule elements, uniting the radial tubes (or side buds) of the paragastric cavity of sponges. They consist of mesoderm, are covered by ectoderm, and are therefore to be considered as really outside the body of the true sponge-wall.

Trabeculæ Cranii. Two bars of cartilage joined and shaped like a lyre, which lie in front of the notochord and em-

brace the pituitary body in vertebrate embryos. By their extensions upward they form the ethmoidal and nasal bones in front and the sphenoidal bones behind. See CARTILAGINOUS CRANIUM.

Trace. Line in which one surface intersects another; usually, intersection of a given surface with one of the co-ordinate planes.

Tracery. In Gothic Architecture, the intersection in various ways of the mullions in the head of a window, the subdivision of groined vaults, etc. See FLAMBOYANT, DECORATED STYLE, and PERPENDICULAR GOTHIC.

Trachea. Main air passage of the lungs; a cylindrical tube forming the front part of the neck, connecting the larynx above with the bronchi below; the wind-pipe. See RESPIRATION, ORGANS OF.

Tracheæ. Breathing tubes of Insects, etc. They consist of a main tube (whose walls are strengthened by the presence of a chitinous spiral thread) on each side, connected with the spiracles, and sending finer branches to all the important parts. The air is brought to the tissues by this arrangement, much as the blood of animals is distributed to their organs and tissues. See DUCTS.

Tracheata. Insects, in a broad sense; Arthropods that breathe by tracheæ, as HEXAPODS, MYRIAPODS, and PERIPATUS (q.v.).

Tracheids. Ordinary wood-cells of prosenchymatous vegetable tissue; elongated cells, closed at both ends; commonly, only those whose walls are pitted.

Trachelium. Neck or space immediately below the capital in the Roman orders.

Tracheopnoa. Division of Arthropods, including the *Arachnoidea*, *Hexapoda*, and *Myriapoda*.

Tracheotomy. Strictly a section of the walls of the trachea, but as usually employed it includes all the operations for cutting through the neck into the air-passage to the lungs. The operation is indicated when there is danger of suffocation, to supply air through the opening, or to remove a foreign body that cannot be reached through the mouth.

Trachoma. Prolific source of blindness through its results. It is the true granular lids, which by the scratching on the cornea causes irritation, with abnormal development of blood-vessels, and opacity (pannus). It is a disease largely due to the vitiated air and unhygienic surroundings consequent upon the congested parts of cities, and is communicable to the eyes of those living in a better environment. At the start, the mucous membrane is inflamed, and contains two or three or more translucent granules, resembling sago grains. No domestic remedy is of use.

Trachomedusæ. Group of *Hydromedusæ*, of which the *Geryonidæ* are typical. See TRACHYMEDUSÆ.

Trachymedusæ (TRACHYLINÆ). Suborder of the *Hydromedusæ*, including medusæ which have no asexual, hydroid stage, the medusæ developing from the egg by direct metamorphosis. They have a firm umbrella, supported by cartilaginous ridges, with stiff solid tentacles. The families included are: *Æginidæ*, *Geryonidæ*, *Trachynemidæ*. They fall into two groups, NARCOMEDUSÆ and TRACHOMEDUSÆ (q.v.).

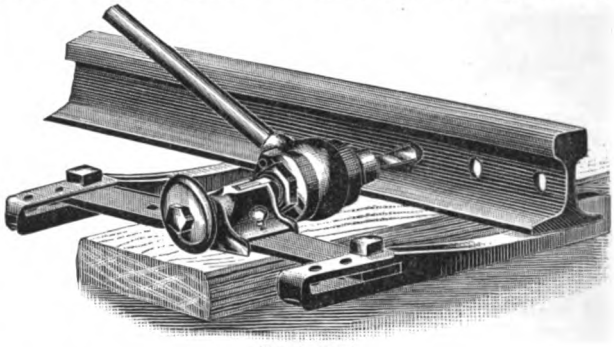
Trachynemidæ. Family of *Trachymedusæ*, having stiff marginal tentacles nearly motionless. The generative organs are on the eight radial canals.

Trachyte. Light-colored eruptive rock, consisting essentially of crystalline feldspar, though quartz may sometimes be also present. It is one of the typical acidic lavas, standing in marked contrast to the basic lava, basalt.

Tracing Cloth. Transparent cloth used for drawing, particularly for copying drawings.

Track Athletics. Races on the cinder track and other sports connected with these, as broad and high jumping, pole vaulting, hammer-throwing and shot-putting. Certain points are usually awarded for victory in each of the contests, and the sum total declares the winner, when different teams, clubs, or organizations are engaged. When individuals contend for an all-round championship, only a few events are used, and a percentage based upon what is considered high performance is used to determine the winner. The first appearance of track athletics as an organized institution was at Oxford. Contests were soon inaugurated between Oxford and Cambridge. Some years later, as a sort of side show to the intercollegiate boat race in the U. S., running races were held, which developed later into the Mott Haven games.

Track Drill. Drill for making holes in the web of a railroad rail while in position in the track. The drill is worked



Track Drill.

with a ratchet and fastened to iron arms whose ends are bent in such a manner as to fit the flange of the rail, as shown in cut.

Tractarianism. Movement beginning at Oxford with Newman, Pusey, Keble, and others, for exalting the Catholic and disowning the Protestant side of Anglicanism; represented in *Tracts for the Times*, 1833–41. Its results were widespread, various, and momentous.

Tractellum. Opposite of pulsellum; flagellum which by a screw-like motion drags the cell to which it is attached after it. This sort is possessed by nearly all the *Infusoria flagellata*.

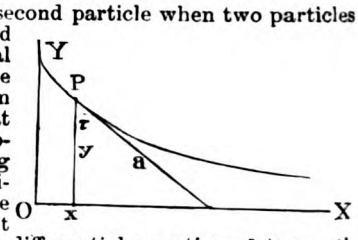
Traction. Force required to pull a load on a street pavement or railroad; usually measured in pounds per ton. Thus on a macadam road ab. 100 lbs. are required to pull one ton. The force of traction is larger at the moment of starting than at slow velocities, but at high velocities it rapidly increases. It is greater for small wheels than for large ones.

Traction Engine. See ROAD LOCOMOTIVE and TRACTION OF LOCOMOTIVES.

Traction of Horses. Force which a horse can exert in pulling a load on a horizontal road. This diminishes as his speed increases, being ab. 250 lbs. at 1 m. per hour, 125 at 2 m., 50 at 5 m., and so on.

Traction of Locomotives. On a level railroad track at common velocities a LOCOMOTIVE (q.v.) must pull 4 to 8 lbs. for each ton of train load. This coefficient of traction becomes greater for very low and for high speeds.

Tractrix. Path of the second particle when two particles are attached to a string and rest on a rough horizontal plane, and, starting with the string taut, one of them moves in a straight line at right angles to the initial position of the string, dragging the other after it. If the initial position of the string be in the axis of Y and the first particle be at the origin, the differential equation of the path of P will be



$$dx = \pm \frac{(a^2-y^2)^{\frac{1}{2}}dy}{y}$$

in which a is the length of the string. Integrating this, we get for the rectangular equation of the curve

$$X = -(a^2-y^2)^{\frac{1}{2}} + a \log \frac{a+(a^2-y^2)^{\frac{1}{2}}}{y}.$$

The intrinsic equation is easily shown to be $S = a \log \sec \tau$, in which S is measured from the starting point, and τ is the angle the string makes with the ordinate of P. Involute of the Catenary.

Tract Societies. Anticipated by the Society for Promoting Christian Knowledge, formed by Anglicans 1701, and by a similar one, undenominational, 1750. Hannah More, 1790, and a Scottish society, 1793, were workers in this field. The Religious Tract Society, founded in London 1799, has issued near 19,000 works in above 3,000,000,000 copies and 212 languages. Societies were formed in New York 1812 and Boston 1814; these were merged in the American Tract Society, organized 1825. This has circulated near 9,000 tracts, books, papers, etc., in vast quantities, largely through colporteurs. Similar societies, general or denominational, exist in almost every Christian land, and in India, China, and Africa.

Tracy, ALEXANDRE DE PROUVILLE, MARQUIS DE, 1603–1670. French general, Viceroy of Canada 1665–67. He subdued the Iroquois and Mohawks.

Tracy, Antoine Louis Charles Destutt, Comte de, 1754–1836. French metaphysician, of the school of Condillac; Senator and Academician. *Logique*, 1805: *La Volonté*, 1815; *Idéologie*, 4 vols., 1817–18; *Montesquieu*, 1828.

Tracy, Benjamin Franklin, b.1830. U. S. Dist.-atty. for e. N. Y. 1866–73; Justice N. Y. Court of Appeals 1881–83; Sec. Navy 1889–93.

Tracy, Joseph, D.D., 1794–1874. Sec. Mass. Colonization Society from 1835. *Great Awakening*, 1842; *Hist. A.B.C.F.M.*, 1842.

Tracy, Roger Sherman, b.1841. American writer on sanitation.

Tracy, Uriah, 1755–1807. M.C. from Conn. 1793–96; U. S. Senator from 1796.

Trade, Board of. See Board of Trade.

Trade Capital. That from which a money income is derived, including all those external commodities which the owner uses in his trade, both for direct sale and for the production of goods for sale.

Trade Cumulus. Small detached cumulus of uniform size and shape, characteristic of the trade-wind regions in mid-ocean.

Trade Dollar. Minted in the U. S. under the act of 1873 for use in e. Asia; not coined since 1883; never legal tender. It weighed 420 grs. and contained 378 grs. of silver. See Dollar.

Trade-Mark. That by which an owner's wares are known in trade. Its objects are to protect him from competition with inferior articles, and to protect the public from imposition. It may consist of a token, letter, sign, or seal. In many countries they are protected by registration and statute.

Trade Risks. Those which are common to all business establishments, as fluctuations in the markets for raw materials and for finished goods, sudden changes of fashion, new inventions, and the entrance of rivals into the field.

Tradescant, John, ab.1570–1638. Holland traveler and naturalist who traveled extensively in Europe, Asia Minor and n. Africa. He established a botanic garden at s. Lambeth, Eng.—His son, John, 1608–1662, added largely to the collection, which he presented to E. Ashmole, and which became the nucleus of the Ashmolean Museum, which was presented to Oxford Univ. 1682.

Trade Schools. See Industrial Training Schools and Manual Training.

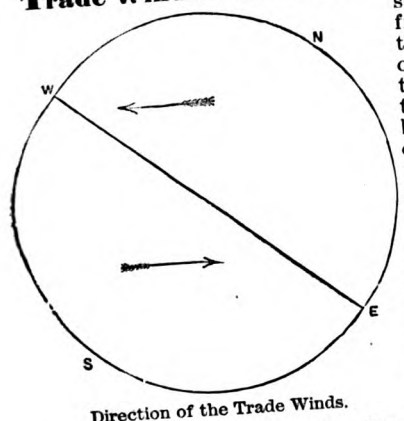
Trades Councils. Organizations of delegates from the laborers in any city or other locality: so called usually in England; in America known as Central Labor Unions.

Trades-Union Congresses. Annual gatherings in England, since 1868, of delegates from various local, national, and international trades unions, and from trades councils, for the purpose of concerting united action on the part of the organized working classes.

Trades Unions. Organizations of laborers or artisans in any one industry, with the object of preserving or gaining advantageous wages, hours and other conditions of labor, and of taking such other united action as may seem desirable.

Trade-Wind Dust. Dust collected on the rigging of vessels in the region of trade winds. According to Ehrenberg, it consists of siliceous diatoms from the interior of the African continent.

Trade Winds. Winds which in the torrid zone, 30° either side of the equator, blow from the same quarter throughout the year, n. of the equator from N.E. to S.W., s. of it from S.E. to N.W. They are caused by the combination of the earth's velocity of rotation with that of the currents of air from the poles toward the equator.



Direction of the Trade Winds.

Tradition. Body of doctrine supposed to have been handed down orally from the Apostles, apart from books; defined by Vincent of Lerins 434 as that which was received always, everywhere, and by all. The R.C. Ch. has always laid great stress on this: Protestants rely mainly on the written Word.

Traditores. Early Christians, who, under threats, surrendered copies of the Scriptures to the Roman officers to be burned. Serious controversies occurred as to the measure of discipline deserved by them.

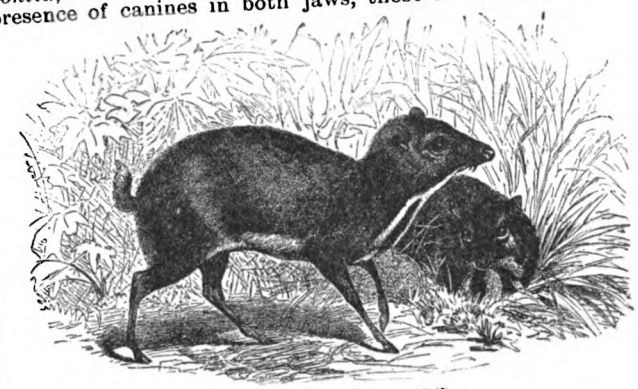
Traducianism. Doctrine that souls, like bodies, come through ancestry and parentage; held by several Fathers and some modern divines; opposed to the opinion that each soul is separately created.

Trafalgar. Cape on s. coast of Spain, w. of Strait of Gibraltar; scene of the victory of 33 British vessels, Oct. 21, 1808, over 40 French and Spanish ships, of which 20 were lost, and their three admirals taken. Nelson was slain, and near 1,600 of his men killed or wounded.

Tragacanth. Inodorous, nearly insipid, whitish, semi-transparent mucilaginous substance, obtained from several low, spiny shrubs of the genus *Astragalus* in Asia Minor and neighboring islands. The gum is the transformed cell of the pith and medullary ray and not a secretion of the sap. It is used as a demulcent and emollient.

Tragedy. Most serious form of dramatic composition, ending usually in the chief character's death: developed in Greece chiefly by Æschylus, Sophocles, and Euripides; less prominent among the Romans; revived in France and England ab.1540–62, and practiced most successfully by Shakespeare. It forms an essential and honored part of every modern literature.

Tragulina, or Schizopoda. Comprising the family *Tragulinidæ* or *Tragulidæ* (Chevrotains), of the suborder *Selenodontia*, characterized by absence of horns in both sexes, and presence of canines in both jaws, those in the males form-


Kanchil (*Tragulus kanchil*).

ing tusks. The psalterium is absent; the placenta is diffuse; a cannon-bone is absent or formed late in life; and the second and fifth digits, though small, are present. They are small animals of W. Africa and India, often mistaken for Musk Deer.

Trailing. Plants which bend over and run along on the ground without striking root.

Trailing Arbutus. See Arbutus, Trailing.

Trailing Switch. One so arranged that a train passes through it in a direction away from its points. See Facing Switch.

Traill, Catherine Parr (Strickland), b. 1802, m. 1832. Writer on Canada.

Traill, Robert, d.1847. Irish translator of Josephus, 1846.

Traill, Thomas Stewart, M.D., 1782–1862. Prof. Edinburgh from 1832; ed. *Encyc. Britannica*, 8th ed., 1853–61. *Medical Jurisprudence*, 1837.

Train, Elizabeth Phipps, b. ab.1860. Novelist of Mass. *Autobiography of a Professional Beauty*, 1896. Her *Social Highwayman*, 1895, was successfully dramatized.

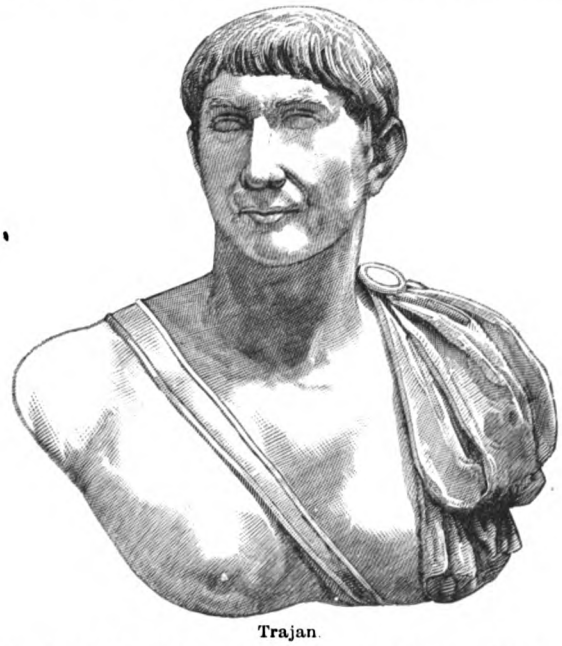
Train, George Francis, b.1829. American traveler, lecturer, and writer. Noted of late years for eccentricity. *Union Speeches in England*, 4 vols., 1862.

Training Ship. See Nautical Schools.

Trainshed. Roofed part of a railroad station where trains arrive and depart. The Grand Central Station in New York has a main trainshed 200 ft. in span, 600 ft. long, 96 ft. high, with 12 tracks, and an annex 96 ft. span, 650 ft. long, 22½ ft. high, with 5 tracks. At St. Louis the trainshed is roofed with 5 spans, having a total width of 601 ft. and a length of 700 ft., covering 30 tracks. The Pa. R.R. trainshed at Jersey City is 256 ft. in span, 653 ft. long, 86 ft. high, with 12 tracks. The Phila. & Reading R.R. trainshed at Phila. is 266 ft. span, 507 ft. long, 88 ft. high, and has 13 tracks. The Pa. R.R. trainshed at Phila. is 304 ft. in span, 598 ft. long, 100 ft. high, with 16 tracks; this is the largest span in the world.

Traitor. One who betrays his country to its enemies, violates his allegiance, surrenders his command or the position intrusted to his defense, for the purposes of treason, or one who levies war or aids an enemy in acts of war against his country.

Trajan, MARCUS ULPIUS, 52–117. Roman Consul 91, Emperor 98; eminent as general, financier, and administrator. He twice subdued the Dacians, conquered most of the Parthian



Trajan.

empire 115–116, added Arabia Petræa to the empire, founded colonies, built roads, bridges, aqueducts, libraries, a theater, and a forum. Most of his conquests were afterward relinquished.

Trajan's Wall. 1. In Roumania; ab. 50 m. long; from the Danube to the Black Sea; built 377 by an officer of Valens, against the Visigoths. 2. Similar wall n. of the Danube, from the Pruth to the Black Sea.

Trajectory. Path described by the center of mass of a projectile after leaving the muzzle of the gun. In air it is a complex curve; in vacuo it is a plane curve, being a portion of an ellipse, having the center of the earth at the further focus. Under the supposition of the action line of gravity being always parallel to the vertical it is assumed to be in vacuo a portion of a parabola.

Trall, RUSSELL THACHER, 1812–1877. American medical writer, especially on hydropathy.

Trama. Dense layers in the pileus of *Fungi*, as toadstools, etc., of the order *Hymenomycetes*, which bear the hymenium.

Tramps. See VAGRANTS and VAGRANCY.

Tramway. Horse railroad, or one whose motive power is not steam, as a cable or electric road; so called chiefly in England. Street railways were first laid in New York 1831, in Paris 1853. See STREET RAILWAYS.

Tramway, AERIAL. This consists of two strong wire ropes, moving in opposite directions, supported in a cast-iron shoe on either end of a cross-bar, fastened to the top of a standard. The latter are placed from 40 to 100 yards apart; across rivers and deep valleys the span may be 600 yards. The rope ends are attached to chains, passing over pulleys and stretched by balance weights. The carriers consist of a small truck, with two grooved rollers which fit the rope; the bucket is suspended from the truck by a hanger, at the bottom of which is the grip for the hauling rope. The latter is an endless rope below the carrying ropes, worked by a grooved pulley and a motor at the station; it is kept taut by counterbalance weights. The stations should be not more than 6,000 yards apart, but two sections could be worked from an intermediate station. The capacity is about 80 tons per hour in both directions. This form of transportation is used to convey ores from the mines to the railroad or shipping, or to the works, and also about the works. There is a line from an iron mine in Spain 17,000 yards long. Their cost of erection and working is small, they are independent of atmospheric conditions and formation of the ground, and have great facility for loading and unloading.

Trance. Form of CATALEPSY (q.v.), wherein there is a prolonged condition of abnormal sleep, from which, ordinarily, the person cannot be aroused, the breathing is almost suspended and sensation is abolished. It is accompanied by a depressed condition of the vital functions. The sleep may last through a period of years with occasional brief returns to consciousness. It is frequently closely associated with hysteria, and is, apparently, a spontaneous going into the mesmeric state.

Tranquillus Suetonius. See SUETONIUS.

Transalpine. Beyond the Alps, the point of view being usually Roman.

Transcaspian Railway. From the Caspian Sea e. to Tashkend in Turkestan; opened to Merv 1886, to Samarkand 1888.

Transcaucasia. Region s. of the Caucasus, and n. of Turkey and Persia, from the Black Sea to the Caspian; held by Russia. Area 91,346 sq. m.; pop., 1890, 5,011,555.

Transcendental Curves. Formerly defined as those whose equations involved transcendental quantities; more recently, as those whose intersections with a right line are without limit.

Transcendental Functions. Those which require for their expression operations other than the ordinary operations of algebra; viz., addition, subtraction, multiplication, division, involution and evolution. They are classified either from their form, as Logarithmic, Exponential, etc., or from their substance, as Trigonometric.

Transcendentalism. 1. Philosophy and philosophic method of Kant. 2. Platonism as interpreted and applied by Emerson, Alcott, and their supposed followers; popular in New England about 1840, and sometimes carried to extremes.

Transcendental Quantities. Those involving operations other than the ordinary algebraic operations, addition, etc.

Transept. Transverse portion of a cruciform church. It is one of the arms projecting each way on the side of the stem of the cross, called the nave. The projections on both sides are frequently dissimilar in style and plan, and are generally placed north and south. Large churches have several transepts. See CROSS AISLE and NAVE.

Transfer of Heat. Where two bodies of unequal temperature are brought together they tend to equalize their amounts of heat, the hotter transferring its heat to the colder. Such transfer is done by radiation, by contact or by conduction; of the latter, convection and circulation are phenomena in fluids. The formula for radiation is: $Q=C(a^t-1)$ in metric units. For contact it is of the form $Q^1=C^1t^{1.233}$, in which Q is the number of metric calories emitted from a unit of surface in a unit of time; C is a constant, dependent on the surface of the body; a is the constant 1.0077 for many bodies, and t is the excess of temperature in Cent. degrees of the radiant over the absorbent body. Similarly, Q^1=the quantity of calories abstracted in a unit of time from a unit of surface, C^1 a constant varying with the form of the absorbing or heating surface, and t the difference of temperature of the two materials. The above contact formula is the one generally used for air. The relative radiating power of substances was determined by Leslie to be as follows:

Lamp black	100	Graphite	75
White lead	100	Tarnished lead	45
Resin	96	Mercury	20
Ordinary white glass	90	Polished iron	15
India ink	88	Tin, gold, silver, copper, etc	12
Ice	85		
Mica	80		

The conductivity of heat in various metals is shown in the following table:

Silver	100.00	Steel	11.60
Copper	73.60	Lead	8.5
Gold	53.20	Platinum	8.4
Tin	14.50	Rose's Alloy	2.8
Iron	11.90	Bismuth	1.8

Transfiguration. Divine splendor, on the Holy Mount, in which Jesus appeared before Peter, James and John, in converse with Moses, representing the Law, and Elijah, the Prophets. It is commemorated Aug. 6.

Transformation of Co-ordinates. Change of the reference of position from one system of co-ordinates to

another, or from one set of axes to another in the same system.

Transformation of Equations. Change of form without destroying the equality.

Transformer. See CONVERTER.

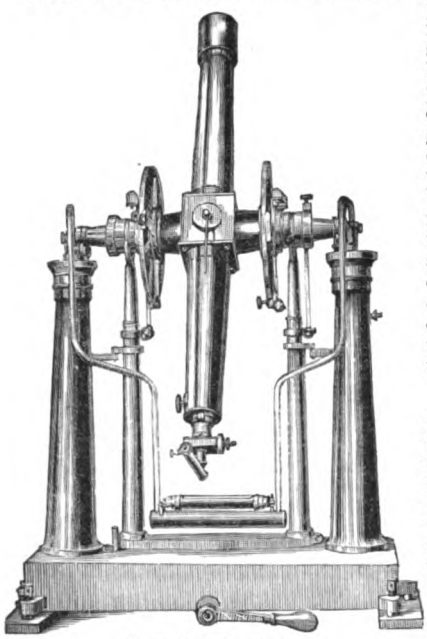
Transfusion of Blood. In cases of extreme debility, more especially when produced by hæmorrhage, fresh blood has been injected into the veins, frequently with happy results. Sometimes the blood has been transferred directly from the artery of the well to the vein of the ill, through a tube of rubber. At others, the blood is caught in a bowl and then injected, either at once before coagulation begins, or after removing the fibrin by whipping. The blood of a lamb has frequently been used. A solution of salt having the same density as the blood, normal salt solution, is probably equally efficacious, and has the advantage that it can be prepared and kept for emergencies.

Transgressions. Actions opposed to the dictates of the moral law.

Transit. See THEODOLITE.

Transit, SOLAR. See SOLAR TRANSIT.

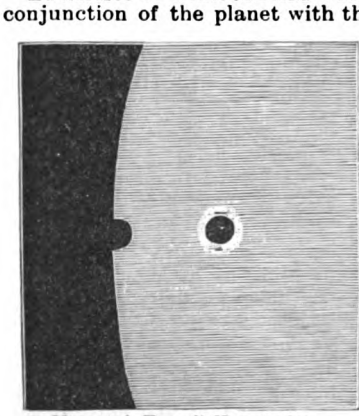
Transit Instrument. Telescope attached to an axis perpendicularly; when revolved about this axis, the line of collimation describes a plane intersecting the celestial sphere in a great circle. It is ordinarily adjusted so that this circle shall be the meridian, and is used for determining the instant of the star's transit over that circle. This gives the data for determining either the clock correction, or the star's right ascension.

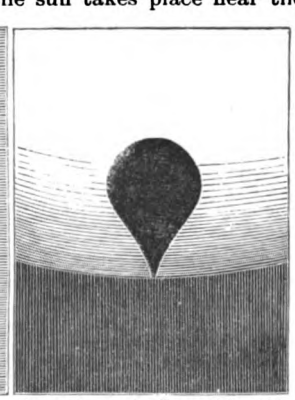

Transit Instrument.

Transition. So-called primitive rocks showing evidences of stratification and containing a few fossils. These have been distributed through the geological column according to the evidence of their organic remains, and the term, first used by Werner, is now obsolete.

Transition Tint. Purplish color seen in Soleil's SACCHARIMETER (q.v.) when the quartz wedges are in a position to give the maximum sensibility; so called because a smaller amount of rotation is required to produce a difference in the color of the two halves of the biquartz from that required for any other tint.

Transits OF MERCURY AND VENUS. These happen when the conjunction of the planet with the sun takes place near the


Mercury's Transit Nov. 5, 1868.


Venus during its Transit in 1709.

planet's node. The limiting distance is not constant, owing to eccentricity of the orbits; in the case of Mercury it is about 2° 10′, with Venus 1° 45′. The actual interval between two transits of Mercury at the same node is usually 13 years, occurring in May. These are ordinarily followed in 3½ years by a transit at the other node in November. The last pair of transits were May 9, 1891, and Nov. 10, 1894. The intervals for Venus at the same node are 8 and 235 years; the transits at one node occur in June, at the other in December. Some of the actual dates are:

Dec. 7, 1631,	June 5, 1761,
4, 1639,	3, 1769,
9, 1874,	8, 2004,
6, 1882,	6, 2012.

Translation. 1. Removal of Enoch and Elijah to heaven without death. 2. Transfer of the relics of a saint. 3. Transfer of a bishop to a new see.

Translation. Rendering into one language the words of another, or the ideas conveyed thereby; practiced largely, since the Revival of Learning, in all civilized lands; important as bringing within reach of all readers whatever is of value in ancient or foreign literatures.

Translation. See MOTION.

Transleithania. Hungary and other parts of the Austrian empire e. of the Leitha.

Translucent. Capable of transmitting light irregularly, as does thin paper; distinguished from TRANSPARENT (q.v.).

Transmigration. See METEMPSYCHOSIS.

Transmission of Power. See POWER TRANSMISSION.

Transmutation of Metals. Alchemy, or the art of transmuting base metals into gold, has been regarded as the parent of modern chemistry. Its basis was the widespread notion of the fundamental identity of matter, and that its individual properties were due to a separable formative force. The alchemists sought to discover a universal solvent, the philosopher's stone, by which this primal matter might be resolved. Its pursuit was bound up with that for the elixir of life, and flourished not only in Mediæval Europe, but especially in China, where it was one of the chief objects of the Taoist patriarchs. See ALCHEMY.

Trans-Neptunian Planets. Possible planets whose orbits are outside that of Neptune. There are some slight indications pointing to the existence of one or two such planets.

Transom. Beam or beams across a window, to divide it into two or more lights in height; the most ancient being from the Early English style. A window having no transom was formerly called a clearstory window.—Also, the cross-bar separating a door from the fanlight above it.

Transpadane Republic. See CISALPINE REPUBLIC.

Transparent. Bodies capable of transmitting luminous rays in such a way that objects can be clearly seen through the substance. See TRANSLUCENT.

Transpiration. Exhalation by plants of watery vapor through the epidermis and its various appendages and modifications.

Transpiration. Passage of a gas driven under pressure through long capillary tubes, or through a porous substance which offers considerable resistance. The action is best studied by forcing the gas through long capillary tubes; the velocity is given by the formula, $v=k.\frac{p\rho}{l}$, in which p is the pressure, ρ the density of the gas, l the length of the tube, and k a certain constant, depending on the various conditions and on the nature of the gas. K is called the coefficient of transpiration.

Transplanting. The bodily removing of a plant or tree from one place to another. It is most practicable in young plants. Frequent transplanting makes young fruit trees more fruitful. Large trees may be removed successfully if enough fibrous roots are allowed to remain uninjured; quick growing and free-rooting trees being most easily transplanted. Evergreens are best transplanted in the spring and deciduous trees after the leaf fall. Securing the tree against wind movement is particuluarly important after transplanting.

Transportation. Process of moving commodities from places in which they are in less demand to places where they are of more value. It is, economically speaking, as truly a productive process as agriculture or manufacturing.

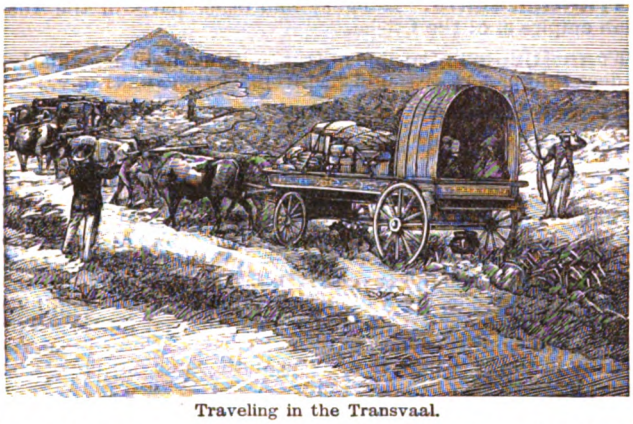
Transportation. Removal of convicts to a distant penal settlement, usually beyond sea; long practiced by England, abolished 1867, and still by France (Guiana and New Caledonia), Russia (Siberia), and some other governments.

Transposing. In Music, the changing of music in performance from the key in which it is written to another key.

Transposition. A quantity is transposed when in an equation (or inequation) it is taken from one member and placed in the other. This change requires a change in the algebraic sign.

Transubstantiation. In R.C. theology, transmutation held to be effected by the Eucharistic consecration, after which the substance of bread and wine is thought to be replaced by the body and blood, soul and divinity of Christ, the accidents, that is, the physical properties and appearances, or species, alone remaining, so that the whole Christ is received under either species, or the least particle of each. See CONCOMITANCE.

Transvaal, or SOUTH AFRICAN REPUBLIC. Inland government of s. Africa, n.e. of the Orange Free State. The country consists mainly of plains, well watered and favorable for raising cattle. Area ab. 114,000 sq. m. Capital, Pretoria. The country was settled 1833–37 from Cape Colony by Dutch



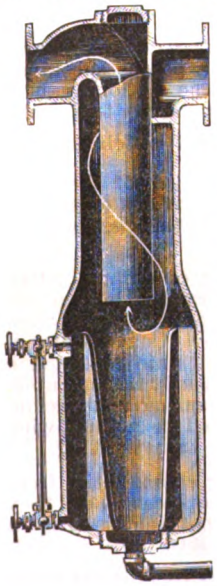
Traveling in the Transvaal.

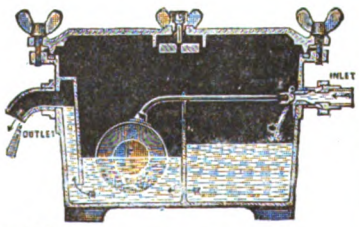
Boers who govern it, though under English suzerainty. Fresh gold fields were discovered 1886, and have attracted English and Americans, who are allowed no share in the government. Discontent thence arising led to Dr. Jameson's raid 1896. Pop., 1890, 120,000, since greatly increased; natives ab. 560,000.

Transversal. Straight line cutting a system of lines.

Transylvania. S.e. part of Hungary; anciently Dacia; conquered by Trajan 107; held by various races; made an Austrian principality 1690–1867. Area 21,518 sq. m.; pop., 1890, 2,247,049, chiefly Roumanian and Magyar.

Trap. Device for catching and separating water from steam in a current of the mixture, allowing the water to be drawn off without escape of the steam. There are two types, lifting or return-traps, and non-lifting or separating. Non-lifting simply catch and hold water, or else allow it to pass, but close when steam gets at them. The first kind are simply vessels into which the supply enters near the top, and which have a relatively large area, so that water falls to the bottom in the reduction of speed of flow, and steam goes out at an outlet at the highest point. The second kind have an expanding diaphragm filled with an expanding fluid (glycerin or a mixture) which, when cooled by a protecting body of water, allows a valve to open through which the water is blown by pressure. When the water is gone, the steam expands the imprisoned fluid, and closes the outlet. Of similar type are the float traps, in which a hollow cup in a pot is floated up by accumulated water, and opens a valve through which the water is blown. In the second great class, the traps catch the water, and deliver it on a higher level than that at which they stand or from which the water comes; they are used in heating systems where the boiler is higher than the lowest pipes of the system. The best is a vessel with a float. Water, lifting that float, opens the steam-valve of a pump which sucks from the vessel until the float drops and shuts off steam. Without a pump, the trap stands at sufficient elevation to allow the water to be discharged by gravity when pressure is equalized. Three pipes enter the trap, two at the top, one at the bottom. Water enters through one of the upper pipes, and lifts the float. The rise of the float closes the upper inlet pipe, and opens a valve in the second upper pipe which lets live steam in; the water is displaced through a check-valve in the bottom pipe. The fall of the float as the trap empties closes the live steam inlet and opens the water inlet; the vapor condensing allows the pot again to be filled to the tripping point. Instead of a float, the whole pot may be counterweighted, when its rise and fall will operate the valves as it empties and fills.





Steam Traps.

Trap. Several kinds of heavy, dark-colored rocks of igneous origin, occurring in dykes and other analogous forms.

Trapani. Seaport of n.w. Sicily, anciently Drapanura; scene of a Carthaginian victory over a Roman fleet 249 B.C. It was of naval and military importance ab.1550, and has a good trade. Pop. ab. 47,000.

Trap-Ball. One of the oldest ball games. Strutt places it before cricket and as early as ab.1325. It is played with a trap, bat, and ball. The trap is somewhat like a low shoe in shape, and has a pivoted tongue upon which the ball rests.

Trapezium. Quadrilateral having no parallel sides.

Trapezoid. Quadrilateral having only two sides parallel. Its area equals the half sum of the parallel sides multiplied by the distance between them.

Trapezuntios, GEORGIOS, 1395–1484. Cretan scholar, in Italy from 1430; Latin teacher and tr. of Greek works.

Trapp, JOHN, 1601–1669. Anglican author of commentaries on the Scriptures, 1646–56, repub. 1866–68.

Trappists. Austere French monastic order, founded 1140, reformed by De Rancé 1660. They have houses at Gethsemane, Ky., near Dubuque, Iowa, and at Tracadie, Nova Scotia.

Traquair, RAMSEY HEATLEY, b.1840. Prof. of Paleontology and director of the museum in Univ. Edinburgh; chiefly engaged in the study of fossil fishes.

Trasimeno, or TRASIMENUS. See PERUGIA.

Trask, GEORGE, 1798–1875. New England crusader against intemperance and the use of tobacco.

Trask, WILLIAM BLAKE, b.1812. New England antiquarian and genealogist.

Trattinick, LEOPOLD, 1764–1849. Curator of the Herbarium in Vienna. *Fungi Austriaci*, 1804–6; *Archiv der Gewächskunde*, 1812–18; *Flora des Oesterreichischen Kaiserthums*, 1816–22; *Botanisches Taschenbuch*, 1821; *Rosacearum Monographia*, 1823–24.

Trautwine, JOHN CRESSON, 1810–1883. American civil engineer. He located many railroads, and made the final survey for the Panama R. R. 1850 *Circular Curves for Railroads*, 1851; *Civil Engineer's Pocket-book*, 1871.

Travancore. State of s. India, tributary to Gt. Britain. Area 6,730 sq. m.; pop., 1891, 2,557,840, mostly Hindu, but ab. 500,000 Christian.

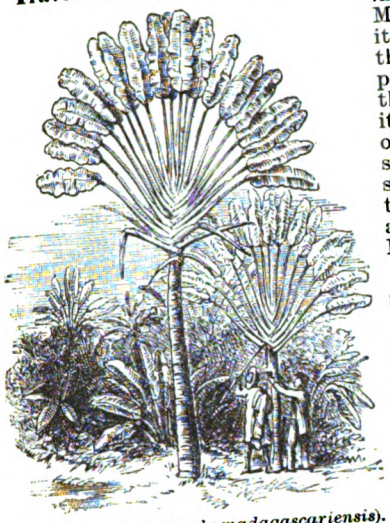
Travel Allowance. In the U. S. military service, when an officer travels without troops under orders, he is entitled to mileage at the rate of 4 cents per mile and to reimbursement of the cost of transportation actually paid by him, exclusive of sleeping and parlor car fares and charges for baggage and transfers.

Travelers. Those using the highway for the purposes to which it is dedicated. An organ-grinder, acrobat, or one using the road as a play-ground, has not the rights of a traveler therein.

Travelers, RIGHTS OF. The rights in railway cars and other means of transportation depend very much on statutes. A ticket is to some extent a contract and entitles the person to safe transportation to the point indicated and to a seat. They may be limited in time, and must be shown when requested. See CARRIERS (COMMON), NEGLIGENCE, and TRAVELERS.

Traveler's Joy. *Clematis vitalba.* Wayside plant, native of Britain, belonging to the natural order *Ranunculaceæ.*

Traveler's Tree. *Ravenala madagascariensis.* Found in great abundance in Madagascar. It derives its name from the fact that large quantities of pure water are found in the cup-like sheaths of its leaf stalks, which is obtained by tapping the sheaths at the base. A similar tree is found in the Malay Peninsula, and called Traveler's Fountain.



Traveler's Tree (*Ravenala madagascariensis*).

Traveling Crane. See CRANE.

Traveling Sidewalk. Movable platform, used as a means of transportation since 1892. There are a series of platforms side by side, traveling at different rates, varying from 2½–3 m. per hour, so as to make it easy to step from one to the other until the last is reached which moves fastest. The motive power is furnished by electric motors attached to the trucks.

Travemunde. Port of Lubeck, at mouth of Trave.

Traverse Table. Tabulation of the lengths of the sides of right-angled triangles for lengths of the hypotenuse ranging from 1 to 1,000; used by surveyors in computing distances and areas.

Travertine. Calcareous rock or variety of limestone formed by deposition from the water of springs or rivers; usually open in texture or irregularly banded; named from large deposits of the material found on the Tiber near Rome.

Travis, WILLIAM BARRETT, 1811–1836. Texan immigrant from Ala. ab. 1832. With 140 men he held Fort Alamo for ten days against 4,000 Mexicans under Santa Anna. It was taken by storm March 6, 1836, and all the Americans slain.

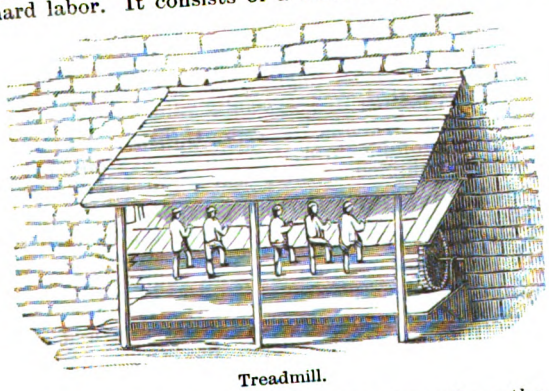
Trawling. Fishing by hooks or nets sunk to the bottom.

Trayastrinsha. Second of the DEVALOKAS (q.v.).

Treacle. See MOLASSES.

Treacle Mustard. See MUSTARD, TREACLE.

Treadmill. Devised by W. Cubitt ab.1818; used in English prisons for enforcing a portion of the sentences of imprisonment with hard labor. It consists of a wooden cylinder on an iron



Treadmill.

frame. The cylinder is ab. 6 ft. in diameter and on the outer circumference are steps ab. 7½ in. apart. The power obtained is utilized in grinding corn or pumping water.

Tread-Softly. *Jatropha stimulosa.* Stinging herb of the natural family *Euphorbiaceæ*, native of the s.e. U. S.; known as Spurge-nettle.

Treadwell, DANIEL, 1791–1872. Prof. Harvard 1834–45; inventor of a power press 1821, a hemp-spinning machine 1829, and improvements in cannon 1835.

Treadwell, JOHN, LL.D., 1745–1823. Delegate to Congress 1785–86; judge in Conn. 1789–1809; Gov. 1809–11.

Treadwell, SEYMOUR BOUGHTON, 1795–1867. Anti-slavery journalist in Mich. *American Liberties*, 1838.

Treason. Acts of violence against the person of the sovereign, against the state in favor of a foreign enemy, or against the internal government of the country. In the U. S. it is generally defined by statute.

Treasure Trove. Money found hidden in the earth, whose owner is unknown. At common law, it belonged to the crown. In the U. S. it generally belongs to the finder. Widespread belief in buried treasure naturally arose from the custom still practiced in India and other parts of the East of concealing jewelry and valuables for safe keeping in the ground. In the search for such treasure magical arts are commonly employed, the superstition being current that such treasure is guarded by demons or genii, who can only be overcome by magic. In America, the reputed treasures of the ancient Incas and of the pirates and buccaneers of the Spanish Main are still sought.

Treasury, U. S. Constituted by law Sept. 2, 1789; Alexander Hamilton was the first secretary. There are a treasurer, 3 assistant treasurers, 3 comptrollers, 6 auditors, register, commissioners of customs and internal revenue, solicitor, director of the mint. There are 18 bureaus, including the mint, statistics, coast survey, life-saving service, lighthouse board; most heads of bureaus are independent of the nominal head, many are appointed by the President.

Treat, ROBERT, 1622–1710. Gov. of Conn. 1683–87 and 1689–98.—His descendant, SAMUEL HUBBELL, 1811–1887, was Judge of Ill. Supreme Court 1841–55, and U. S. Judge for s. Ill. from 1855.

Treaty. Agreement, usually in writing, between nations. The manner of negotiating for it and of making it effective is determined by the law of each country. In the U. S., an authorized treaty becomes part of the supreme law of the land. It is made by the President and requires two-thirds of the votes of the Senate for ratification. If a payment of money is involved a majority of the House of Representatives must approve.

Trebbia. Branch of the Po, on whose bank Hannibal gained a victory over the Romans 218 B.C. Here the Russians under Suwarow defeated the French June 1799.

Trebelli, ZELIA, 1838–1892. Mezzo-soprano singer of German descent, known through Europe from 1859, and in the U. S. 1884.

Trebellius Pollio, 4th cent. Latin biographer of the emperors from Philip to Claudius, 244–270. His work from 254 survives.

Trebizond. Seaport of n.e. Asia Minor, on the Black Sea; anciently Trapezus; founded ab.700 B.C. from Sinope. Here Xenophon and the Ten Thousand Greeks emerged 400 B.C., after their retreat from Cunaxa in Babylonia: under

Trebizond.

Roman rule it was the capital of Pontus. Here Alexis Comnenus in 1204 founded an empire, or seacoast kingdom, including Pontus and most of Colchis, which was overthrown by the Turks 1462.

Treble. Highest voice in a chorus or other concerted vocal piece, and the upper parts in concerted instrumental music; also the soprano voice.

Trecul, AUGUSTE ADOLPHE LUCIEN, 1818–1896. French botanist.

Tredgold, THOMAS, 1788–1829. English engineer and architect. *Carpentry*, 1820; *Cast Iron*, 1821; *Steam-engine*, 1827.

Trediakofsky, VASILI, 1703–1769. Russian critic, versifier, and translator.

Tree, CHRISTMAS. The tree erected at the Christmas festival in the U. S. and in Germany, from whence it was introduced, is a survival from primitive times before Christianity, when it was connected with the festival of the revival of the sun after the winter-solstice. This festival was widely celebrated by the nations of antiquity with ceremonies relative to the new light which the new sun brought into the world. The tree with its candles, symbolic of the new light, is found widely distributed. It existed in China before the Christian era, and still survives in China and Japan, in a form not unlike our own Christmas tree, at the festival of the New Year.

Tree, HERBERT BEERBOHM, b.1853. English actor and manager.

Tree-Ducks (DENDROCYGNA). Ab. 12 species of arboreal, tropical ducks, with long necks and long hind toes. See ANATINÆ.

Tree Frog. See DISCODACTYLIA.

Treenails, or TRUNNELS. Wooden pins employed to fasten the planks of a ship's side and bottom to the timbers.

Tree of Heaven. See AILANTHUS.

Trees. Woody plants, generally forming a single main trunk of indefinite size and duration.

Tree-Snakes. The common southern green snake is one of the *Colubridæ*. The tropical Tree-snakes represent the families *Dendrophidæ*, *Dipsadidæ*, and *Dryophidæ*. They are all brightly colored, green as a rule predominating. In the first family, the ventral scutes are keeled; the largest (*Goniosoma*, of Borneo) attains a length of 8 ft. They are good climbers, can descend a smooth tree trunk, and are very swift in their motions. Some species dart ferociously at intruders. As in

Tree-Snake (*Dryophis pulverulentus*).

all non-poisonous snakes, the loreal scale is present. The second family includes crepuscular and nocturnal forms. An E. Indian species grows to a length of 7 ft.: it is black, with yellow bars, and gentle in captivity. The third family is characterized by great slenderness of body (1 in. diameter, to 5 ft. in length); the nose is a pointed proboscis. The green snake of India attains a length of 7 ft. and is greatly feared, as it darts at the eyes of travelers who come near.

Trefoil. Foliation in Gothic Architecture in window heads, paneling, etc., representing a three-lobed leaf.

Trefoil. See CLOVER.

Trefoil, SHRUBBY. See HOP-TREE.

Tregelles, SAMUEL PRIDEAUX, LL.D., 1813–1875. English editor *Greek New Testament*, 1857–72. *Concordance*, 1839–43; tr. Gesenius' *Hebrew Lexicon*, 1847.

Treitschke, HEINRICH GOTTHARDT VON, 1834–1896. Prof. Freiburg 1863, Heidelberg 1867, Berlin 1874; Prussian historiographer 1886. *Sozialismus*, 1875–78; *Deutsche Geschichte*, 5 vols., 1879–85.

Trelawney, EDWARD JOHN, 1792–1881. Companion of Shelley and Byron, of whom he pub. *Recollections*, 1858–78.

Trelease, WILLIAM, b.1857. Prof. Univ. Wis. 1881–85; director Mo. Botanic Garden 1889.

Tremandreæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 3 genera and ab. 27 species, distributed throughout the tropical parts of Australia.

Tremarec, KERGUELEN-. Breton sailor who discovered Kerguelen's Land 1772, in the Antarctic Ocean, 48° 39′ S. lat. and 68° 42′ E. long. It is 85 m. by 79 m. It was called Desolation Island by Captain Cook 1776.

Trematoda (FLUKES). Parasitic Platyhelminths, with flattened, ovoid, unsegmented bodies, having one or more suckers for attachment. They have a forked intestine, a mouth, but no anus. Most are hermaphroditic, and many have complicated alternation of generations, developing by sporocysts or rediæ, and cercaria stages, as in *Distomum*. There are two suborders, DISTOMEA and POLYSTOMEA (q.v.).

Trembles. Two entirely different conditions, the one a disease of neat cattle, communicable to those who drink their milk or eat their flesh, and known as Milk-sickness. It is marked by chills, vomiting, and disordered nutrition. —The other condition is that of paralysis agitans or PALSY (q.v.).

Tremellineæ. Order of gelatinous *Fungi*, of indefinite forms, occurring on dead wood.

Tremellius, EMMANUEL, ab.1510–1580. Italian of Jewish parentage, prof. Sedan; author, with F. Junius, of a Latin version of the Bible, 1575–79.

Tremelloid. In Botany, gelatinous.

Tremie. Wooden rectangular closed trough, placed in a nearly vertical position in water. In it mortar is allowed to slide down to a foundation at the bottom of the stream; its office is to prevent the current from washing away the mortar.

Tremolite. Light-colored variety of the mineral amphibole, usually columnar or fibrous in texture; named from the Tremola Valley in the Alps.

Trench. Ditch with vertical sides, which are often held in place by sheet piling.

Trench, RICHARD CHENEVIX, D.D., 1807–1886. Prof. King's Coll., London, 1847; Dean of Westminster 1856; Abp. of Dublin 1864–84. *Poems*, 1835–65; *Parables*, 1841; *Miracles*, 1846; *Synonyms of N. T.*, 1854–63; *English Past and Present*, 1855. His *Study of Words*, 1851, was especially valued.

Trenchard, STEPHEN DECATUR, U.S.N., 1818–1883. Commander 1862; prominent in the two attacks on Fort Fisher; Captain 1866, Commodore 1871, Rear-admiral 1875.

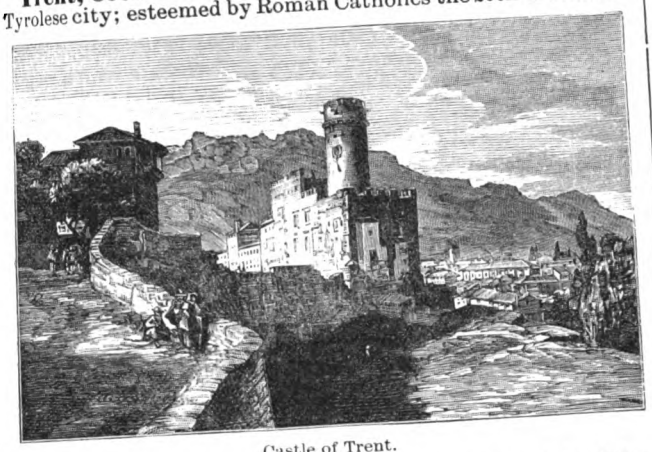
Trench Cavalier. Earthen parapet constructed, during siege operations, a short distance from the covered way, to enable the besieger to command that defensive work and to drive the defenders from it by an enfilade fire.

Trenck, FRANZ, FREIHERR VON, 1711–1749. Austrian officer, notorious for his atrocities in Bavaria and elsewhere 1740–45. He committed suicide in prison.—His cousin, FRIEDRICH, 1726–1794, accused of an intrigue with Princess Amalia, sister of Frederick II., was imprisoned at Glatz 1746–47, and at Magdeburg 1758–63, after serving in Austria. His *Memoirs*, 1787, made him famous; his other writings are forgotten. After many travels and adventures he was guillotined in Paris.

Trendelenburg, FRIEDRICH ADOLF, 1802–1872. Prof. Berlin from 1833; reviver of the study of Aristotle; critic of the Kantian and Hegelian philosophy. *Logic*, 1837, tr. 1881; *Logische Untersuchungen*, 1840; *Naturrecht auf dem Grunde der Ethik*, 1860.

Trent. British mail steamer, from which Mason and Slidell, Confederate commissioners to England, were seized by Capt. Wilkes, U.S.N., Nov. 8, 1861. The affair threatened unpleasant relations with England, but the commissioners were surrendered Jan. 1, 1862, as the precedents were all against their detention.

Trent, COUNCIL OF. Held 1545–52 and 1562–63 at Trent, a Tyrolese city; esteemed by Roman Catholics the 20th Œcumeni-



Castle of Trent.

cal or General Council. It settled R.C. doctrine and discipline after the shock of the Reformation. Its decrees were confirmed 1564.

Trente et Quarante. See ROUGE ET NOIR.

Trente et Un. See ROUGE ET NOIR.

Trenton. Capital of N. J. (since 1790) and of Mercer co., on the Delaware, at the head of navigation; chartered 1792; chiefly noted for its manufactures of iron, steel, pottery, rubber and wool, and for Washington's capture of 1,000 Hessians, Dec. 26, 1776. Pop., 1890, 57,458.

Trenton. Fossiliferous limestone, first studied in N. Y., where it forms the main fossiliferous mass of the Lower Silurian strata, now known as Ordovician. It is in part the equivalent of the Llandeilo group of Wales. See ORDOVICIAN.

Trenton Falls. In Oneida co., N. Y., 17 m. n.w. of Utica; series of fine cascades, descending 312 ft. within two miles.

Trent River. Rising in Rice Lake, Ontario, it flows 150 m. into Bay of Quintè, Lake Ontario.—Also river of England which joins the Ouse ab.15 m. w. of Hull, forming the Humber, after a s.e. course of ab.150 m.

Trepang. Dried body of several species of sea-cucumbers, which are found on reefs on the s.e. coast of Asia. The animal is from 8 to 24 in. long. Large quantities are prepared for the Chinese market. See HOLOTHUROIDEA.

Trephining, or TREPANNING. Surgical operation, consisting in removing a circular section of bone, usually the skull, by means of a trephine; this is a cylindrical instrument, slightly conical, up to 2 in. diameter, burred in its sides, with saw-teeth on its lower edge and a center-pin on which it turns; a gimlet handle is attached to the top. It is performed to relieve pressure on the brain, as in case of fracture of the skull, for the drainage of abscesses or removal of tumors. Trephining was practiced in the Stone Age, and later to a considerable extent. Quite recently it was applied in most head injuries, but it is now much restricted.

Trepidation. Slow oscillation of the Ecliptic, imagined by the Arabian astronomers to account for the discrepancy in the determination of the precession of the equinoxes. The period was supposed to be 7,000 years. See PRECESSION OF THE EQUINOXES.

Trescott, WILLIAM HENRY, b.1822. American diplomat; plenipotentiary to China 1880, to Chili, Peru and Bolivia 1881, and to Mexico with Gen. Grant 1882. *Diplomatic Hist. of Washington and Adams*, 1857.

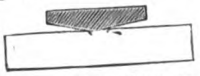
Trespass. Unlawful interference with another's person or property.

Trestle. Structure of wood or iron, built on land, instead of an embankment to carry a railroad track or roadway. See BENT.

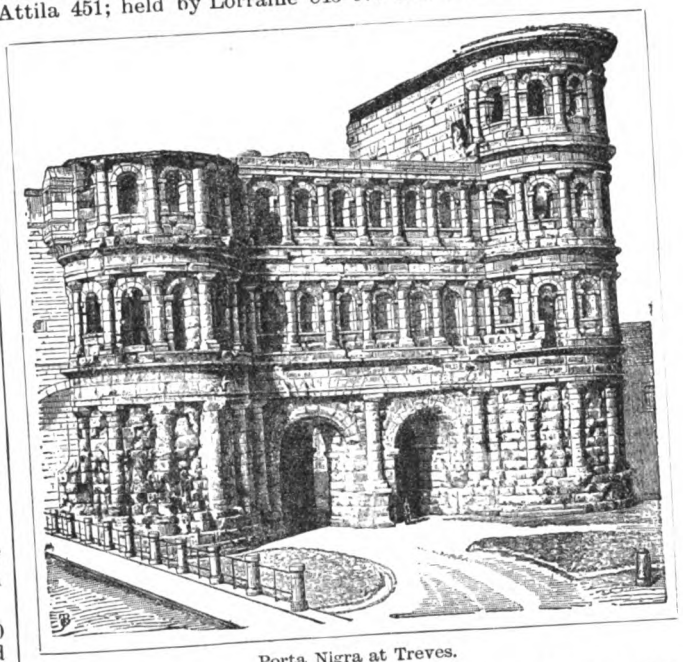
Tretenterata. See ECARDINES.

Trevelyan, SIR CHARLES, 1807–1886. Anglo-Indian official and reformer, knighted 1848; Gov. of Madras 1859–60; Finance Minister of India 1862–65; opponent of the purchase of commissions in the army; Baronet 1874. *Christianity and Hinduism*, 1881.—His son, Sir GEORGE OTTO, b.1838, M.P. 1845, Cabinet Minister 1884, Sec. for Scotland 1886 and 1895, pub. a *Life* of his uncle, Lord Macaulay, 1876. *Cawnpore*, 1865; *Early Hist. of C. J. Fox*, 1880.

Trevelyan's Rocker. Mass of copper, the bottom of which is curved so that it may rest upon the long edges formed on either side of a groove in a block of lead, upon which it is placed. If this be heated and placed on the lead, the points of contact suddenly expand by the heat and the rocker is pushed upward; the temperature as suddenly falls at these points, and the piece settles back, only to be forced up again by the local expansion. The whole thus oscillates rapidly and emits a sound the pitch of which depends upon the conditions of the experiment.



Treves, or TRIER. Ancient city of Rhenish Prussia, prominent under Roman rule as Augusta Trevirorum; sacked by Attila 451; held by Lorraine 843–870 and 895–924; long ruled



Porta Nigra at Treves.

by its abps., who were Electors of the Empire from ab.1200. Its "Holy Coat," first mentioned 1106, attracts many pilgrims. Pop., 1891, 36,162. See HOLY COAT OF TREVES.

Treviranus, CHRISTIAN LUDOLF, 1779–1864. Prof. of Botany at Bonn. *Vom inwendigen Bau der Gewächse und von der Saftbewegung in denselben*, 1806; *Pflanzenphysiologie*, 1841; *Vermischte Schriften anatomischen und physiologischen Inhalts*, 1821, with G. R. Treviranus; *Physiologie der Gewächse*, 1835–38.

Trevithick, RICHARD, 1771–1833. English engineer, in Peru 1816–27. He introduced many improvements in engines, chiefly for mines, and did pioneer work on railways.

Trevor, GEORGE, D.D., 1809–1888. Canon of York 1847. *Convocation*, 1852; *India*, 1862; *Egypt*, 1866; *Rome*, 1869; *Eucharist*, 1869.

Trevor, SIR JOHN, 1633–1717. Speaker of the Commons 1685–88 and 1690–95, when he was expelled for corruption; Master of the Rolls 1685–88 and from 1693.

Triacetine. $C_3H_5(C_2H_3O_2)_3$. Thick liquid, prepared by the action of acetic acid upon glycerin; used in cotton printing. See ACETINES.

Triadelphous. Flowers whose stamens are united into three sets, as in St. John's Wort and related plants.

Triad Society. Chinese secret society, so called from the cosmical triad of Heaven, Earth, and Man. Its object is the overthrow of the present Manchu dynasty and the re-establishment of the last Chinese dynasty of the Mings. It is a common source of disturbance in s. China, and practically governs the Chinese in their foreign colonies.

Triæne. Cladose rhabdus, the branches (cladi) being usually at one end. Such spicules are present in *Geodia*, a genus

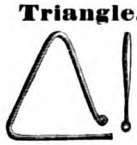
of sponges. There are several modifications, as amphitriæne, protriæne, dichotriæne, found in other genera.

Trial. Judicial examination of the issues of fact or of law involved in a legal proceeding.

Trial by Court-Martial. See COURT-MARTIAL.

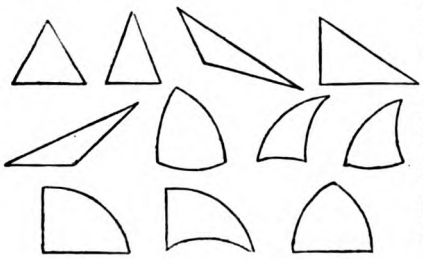
Triandria. Linnæan class of plants, comprising those which have three stamens, as Crocus, Iris, and most of the Grass family.

Triangle. Musical instrument consisting of a steel rod bent in the form of an isosceles triangle, open at one angle. It is struck with a rod of the same metal. At the Grand Opera in Paris they are $7\frac{1}{2}$ in. on the longest sides and 7 in. on the short side; the rod is $\frac{7}{16}$ in. diameter. It has been used by many composers as an adjunct to the drums and in most military bands.


Triangle.

Triangle, AREA OF. Half the product of its base and altitude; half the product of two sides into the sine of the included angle; half the square of one side into the product of the sines of the adjacent angles, divided by the sine of the sum of these angles; square root of the continued product of the half sum of the three sides into this half sum diminished by each side successively.

Triangle, PLANE. Plane polygon of three sides. It is equilateral, isosceles or scalene, as the three sides are equal, two, or none: it is right, obtuse or acute, as one angle is right, one obtuse, or all acute. The sum of the interior angles equals two right angles. A spherical triangle is bounded by three arcs of circles. See SPHERICAL TRIANGLES.


Triangles.

Triangle of Forces. Whenever three forces acting at a common point are in equilibrium, they can be represented by the sides of a triangle whose lengths are proportional to the magnitudes of the forces, and whose directions are parallel to those of the forces. Several forces in equilibrium can be represented by a polygon. See FORCES, POLYGON OF.

Triangular Truss. Bridge truss in which the struts and ties of the webbing have the same inclination; generally one truss having a single system of webbing.

Triangulation. See PRIMARY TRIANGULATION and GEODESY.

Triassic. Lowest division of the Mesozoic rocks; named from its threefold division in Europe; often accompanied in America with erupted volcanic materials, and chiefly found in Nova Scotia, Connecticut Valley, N. J., Pa. and N. C. The oldest reptilian remains are found in this formation. See COLUMN.

Tribal State. That stage in the development of mankind in which the tribe is the only unit of social organization, land being held in common, and little or no complexity of industrial condition existing.

Tribasic Acid. See ACID.

Tribe. In Botany, group of genera subordinate to a family.

Tribes. Twelve divisions of Israel, descended from the twelve sons of Jacob, Reuben, Simeon, Levi, Judah, Issachar, Zebulun, Joseph, Benjamin, Gad, Asher, Dan, Naphtali. Levi having been made a priestly caste, Joseph was divided into the two tribes of Ephraim and Manasseh, to maintain the number.

Tribonianus, d. ab.545. Jurist and official under Justinian; one of the framers of the *Code* and *Institutes*, and chief compiler of the *Pandects* or *Digest*.

Tribromacetaldehyde. See BROMAL.

Tribromphenol. $C_6H_2 \vdots OH.Br_3$. White needles; mpt. 95° C.; prepared by the action of bromine upon phenol. The yellow compound produced by the immediate action of bromine water upon phenol is $C_6H_2 \vdots OBr,Br_3$.

Tribune. Originally the seat of the ruler or judge in a basilica, later of the bishop, and finally any elevated part of a church or public building.

Tribune. Roman official title, used to designate several different offices. The military tribunes were lieutenants of the commanders; when the contest between the orders was raging over the choice of Consuls, military tribunes were elected with consular power for a number of annual terms, and exercised the highest magistracy of the state. The tribunes of the treasury were, perhaps, army paymasters. The tribunes of the people were the most important, and were appointed first 490 B.C., to be the advocates of the oppressed plebeians. This office maintained itself with varying success, and its occupants were leaders in the struggle which won for the lower order equal political rights. Being endowed with an absolute power of veto in all public assemblies, it was a real menace, in the hands of demagogues, to the constitution, and under the Gracchi brought on revolution. The emperors chose to veil their power under the name of the tribunician office.

Tributer. Miner who engages to work a mine, or section of a mine, on condition of delivering to the owner a specified part of the gross yield, retaining the remainder.

Tributyrin. See BUTYRINES and BUTTER.

Trichechidæ. Family of *Pinnipedia*, including the Walrus. Except in the dentition and the absence of external ears, they are similar to the *Otariadæ*. Nearly all the incisors are lost in early life, while the upper canines grow from persistent pulps into two downward-turned tusks, which the animal uses for digging, for lifting itself upon ice floes, and for offense and defense. The Atlantic and Pacific species are distinct.

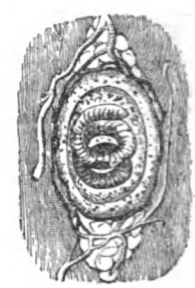
Trichechodont Dentition. Form of molar teeth of the antiodont-lophodont series, having the tubercular ridges of their crowns confluent into two or more transverse crests, as in the teeth of the elephant, dinotherium, kangaroo, manatee, and lower jaw of the tapir.

Trichechus. See MANATEE.

Trichiasis. Misplaced eyelashes, their malposition causing them to rub against and to irritate the eye-ball. Relief can be obtained by extracting the lash, which will return and irritate. A cure can be brought about by destroying the hair follicle producing the lash, or changing the direction of the growth of the lash.

Trichina Spiralis. Parasitic nematode, found in the alimentary canal of man, carnivorous mammals, the pig, and the rat; discovered by Richard Owen 1835. The eggs develop within its body, and the young burrow into the muscles of the host, where they become encysted. Then, if eaten, they escape from

Sexually mature female *Trichina spiralis* (highly magnified).


Trichina lying coiled up in muscle (magnified).

the cysts and become sexually mature. Each female can produce 1,000 young, which, by the pain and disturbance they cause, while burrowing through the tissues, give rise to the disease called Trichinosis. The rat is the natural host of the Trichina, which is thence transferred to the pig. Thorough cooking of pork kills the encysted Trichinas. See TRICHOTRACHELIDÆ.

Trichinopoli. Town of s.e. India, on the Caveri, 56 m. e. of Madras; seat of several missions, and burial-place of Bp. Heber. It has manufactures of tobacco, hardware, and jewelry. Pop., 1891, 90,730.

Trichinosis, or TRICHINIASIS. Disease due to food containing *Trichina spiralis*, first recognized by Zenker 1860. With man it has been produced by eating smoked, pickled or imperfectly cooked pork, containing the encysted worms: 90,000 have been found in a cubic inch of a man's shoulder. The symptoms are pains in the intestines, diarrhœa and vomiting; the muscles become swollen and tender to the touch; death is due to exhaustion, intestinal irritation or pneumonia, and takes place in four or five weeks. In an epidemic in Germany in 1865 nearly one-third of the cases proved fatal. Convalescence from a severe attack requires three or four months.

There is no means of destroying the parasite when in the muscles. When the disease is suspected calomel and castor oil are given to expel the embryos from the intestines; glycerin is said to kill them.

Trichites. Bundle of delicate spicules, originating in a single cell of a sponge.

Trichloracetaldehyde. See CHLORAL.

Trichloracetic Acid. $CCl_3.COOH$. Colorless prisms, exceedingly soluble in water; mpt. 52° C.; produced by the action of chlorine in sunlight upon acetic acid, or by the oxidation of chloral; strong monobasic acid.

Trichoblast. Vegetable cell of branching form, serving as a receptacle for some secretion.

Trichocephalus. See TRICHOTRACHELIDÆ.

Trichocysts. Organs present in some *Infusoria* (as in *Paramœcium*), resembling the nettle-cells of Cœlenterates.

Trichogyne. Simplest form of the female organ of reproduction, consisting of a single cell with a hair-like projection in certain *Algæ* and *Fungi*.

Trichomes. Various appendages to and outgrowths from the epidermis of plants, as hairs, glands, and scales.

Trichophore. Cells which aid in the conveyance of pollinoids to the carpogone or female organ of reproduction in certain *Algæ*, etc.

Trichoptera. Suborder of *Neuroptera*, including forms having the wings covered with hairs or scales; thus resembling *Lepidoptera*. The hind wings can be folded. The mandibles are aborted; the other mouth parts form a sucking proboscis,

Spring-flies.

or are sometimes aborted. The larvæ live in the water, in cases (cocoons) fastened to stones, and made from leaves, sticks, snail shells, grains of sand, etc., which they can drag about. The *Phryganidæ* or Spring-flies are examples.

Trichoscolices. Group of *Vermes*, including Rotifers and Platyhelminths.

Trichosporangium. Sporangium morphologically representing a hair.

Trichotrachelidæ. Nematode worms with a long thread-like neck and small mouth without papillæ. *Trichocephalus* lives half-buried in the intestinal walls of man and other animals. The eggs are passed out and develop in the water, which, if imbibed, introduces the larvæ into the intestine. TRICHINA (q.v.) is a member of this family.

Triclinium. Roman dining-room.—Also the couch on which they reclined at meals.

Tricolor. Flag of France, adopted ab.1790; white, red, and blue.

Triconodont Teeth. Molar teeth with three subequal, prominent, conic and cutting tubercles, as in the cat.

Tricoupis, SPIRIDION, 1788–1873. Greek Minister, diplomatist, and poet. *Speeches*, 1836; *Hist. Greek Revolution*, 1853–57.—His son, CHARILAOS, 1832–1896, was five times Premier, alternating with his rival, Delyannis, from 1875.

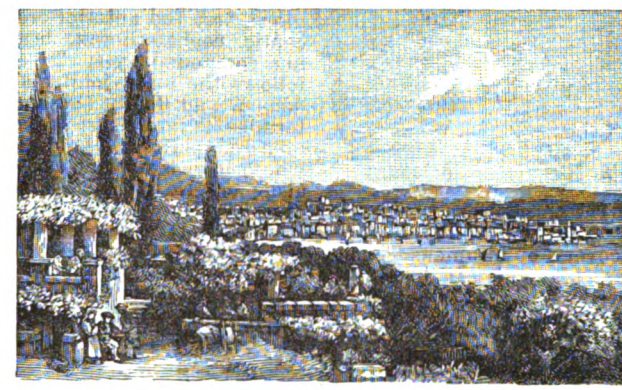
Trident. Three-pronged spear, associated with Neptune and Britannia on coins and other representations.

Tridentine Profession of Faith. Framed 1564 by order of Pius IV., summarizing the decrees of Trent; to be subscribed by R. C. priests, teachers, and converts.

Tridymite. Mineral having the chemical composition and the hardness of quartz, but with a lower specific gravity; found in many parts of the world as a constituent ingredient of volcanic rocks.

Trier. See TREVES.

Trieste. Seaport of Austria, on the Gulf of T., at the head of the Adriatic; anciently Tergestum; Austrian since 1382. Its chief importance dates from ab.1720; its main growth is



Trieste.

recent. It has a fine harbor, a large commerce, much shipbuilding, and extensive manufactures. Pop., 1890, 120,333; district 158,344.

Triewald, SAMUEL, 1688–1742. Swedish satirical poet.

Trifid. In Botany, cleft into three parts ab. half way to the base.

Trifoliolate. Compound leaf, composed of three leaflets, as in clover.

Triforium. Arcade or gallery in a church, above aisle or nave.

Trigeminus. Fifth pair of cranial nerves, the largest of the nerves derived from the brain. They are the great sensitive nerves of the head and face, being distributed to the forehead, the eyelids, cheeks, nose, and upper and lower jaws, including the teeth. They also supply motor impulses to the muscles of mastication, and the lingual branch is one of the nerves of the special sense of taste; known as the trifacial nerves.

Trigger. Pivoted lever, which acts against a projection on the long arm of the sear; the short arm of the sear fits into the full-cock, half-cock, or safety notch of the tumbler. When the trigger is pulled by the finger the sear is withdrawn from its notch and allows the main-spring to operate the tumbler and hammer and drive the firing-pin against the cartridge.

Triglycerides. Compounds, composed of three molecules of a monobasic fat acid and one of glycerin; *e.g.*, tripalmitin, $C_3H_5(O.C_{16}H_{31}O)_3$. See GLYCERIDES.

Triglyph. In the Doric frieze, three vertical angular flutes, separated by narrow flat spaces; in Roman Architecture, placed over the center of the column; in Grecian, close to the angle of the entablature.

Trigonometric Functions OF AN ANGLE. Ratios between the lines which determine the position of any point on the terminal line of the angle in reference to its initial line. They are constant for the same angle: they depend on the position of the terminal line, not upon the points on this line. They are periodic, the same value recurring at least once in each revolution. The primary functions are sine, cosine, tangent, cotangent, secant, cosecant; the secondary, versedsine, coversedsine.

Trigonometry. Branch of Mathematics which treats of the solution of triangles by establishing relations between their sides and functions of their angles, and of trigonometric functions of angles generally. Its divisions are Analytical, Plane, and Spherical.

Trigonous. Of triangular prismatic form.

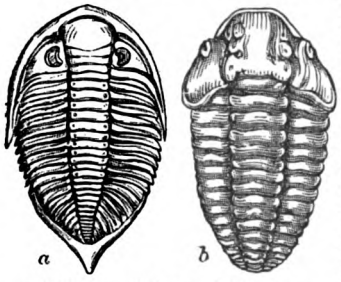
Trigynia. Orders of plants having three pistils.

Trigynous. Tricarpellary; having three pistils.

Trihedral Angle. One formed by three intersecting planes meeting at a common point. Three planes intersecting

at right angles to each other divide the space about their common point into eight equal trihedral angles, each a right trihedral. Trihedrals are measured by the spherical surface included within the planes of their faces.

Trilobites. Fossil *Gigantostraca*, allied to the *Merostomata*, and found in rocks from the Cambrian to the Devonian. The group became extinct in the Carboniferous period. The body of a Trilobite is oval, with a central elevated ridge, the rhachis flanked on each side by broad flat pleural regions. From front to back are 3 regions, first the anterior crescentic cephalothorax, bearing compound eyes. Then follows the many-jointed abdomen, and finally the body terminates in a heart-shaped caudal plate or pygidium, whose base is as wide as the abdomen. No appendages had been found up to 1880, but in 1881 Walcott announced the discovery of biramous appendages, bearing gills, present on every segment. In 1892 Valiant discovered delicate but perfect antennæ in *Triarthrus beckii*, so that, with the mouth parts, the adult possessed 48 pairs of appendages. The nearest relative of this group now existing is *Limulus*, the king crab or horse-foot crab.



a, Phacops caudatus; *b*, Calymene blumenbachii.

Trilocular. Pericarp having three cells.

Trilogy. Series of three dramas, tragic or historical, usually with subjects more or less closely related. Æschylus, Shakespeare, and Schiller afford examples.

Trimble, ALLEN, 1783–1870. Gov. of Ohio 1826–30.—His brother, WILLIAM, 1786–1821, officer in the War of 1812, was U. S. Senator from 1819.

Trimble, ISAAC RIDGEWAY, 1802–1888. Engineer; Brig.-gen. C.S.A. 1861, Major-gen. 1863; active in Va. and at Gettysburg.—His uncle, DAVID, ab.1782–1842, was M.C. from Ky. 1817–27.

Trimble, ROBERT, 1777–1828. Chief-justice of Ky. 1810; U. S. District Judge 1816–26; Justice U. S. Supreme Court from 1826.

Trimera (PSEUDOTRIMERA, or CRYPTOTETRAMERA). *Coleoptera*, with apparently three-jointed tarsus, but with an extra rudimentary joint. The Lady-birds (*Coccinellidæ*) are examples.

Trimerous. Flowers constructed on the ternary plan; *i.e.*, with three members of each circle of parts.

Trimethylamine. $N(CH_3)_3$. Strong organic base, supposed to be derived from ammonia, NH_3, by the replacement of the hydrogen by methyl; gas, easily condensed to a liquid; found in the vegetable world and in herring brine; prepared by the distillation of beet-sugar molasses.

Trimethylcarbinol. $(CH_3)_3.C.OH$. Tertiary butylalcohol; liquid; bpt. 83° C., with an odor like spirits of camphor; present in fusel oil, but usually prepared by the action of dilute sulphuric acid on isobutylene. It solidifies easily, and is completely decomposed by oxidizing agents.

Trimethylene. $(CH_2)_3$. $\begin{array}{c} CH_2—CH_2. \\ \backslash\ \ / \\ CH_2. \end{array}$ Gaseous hydrocarbon, produced by heating trimethylene bromide, $CH_2Br.CH_2.CH_2Br$, with sodium; stable in character.

Trimmer. Piece of timber in a roof or floor to support the ends of joists, which cannot rest upon the walls, as at fireplaces and stairways.

Trimmer, SARAH (KIRBY), 1741–1810, m.1762. English author of historical manuals and juvenile tales. *Hist. Robins*, 1868.

Trimorphism. 1. Flowers whose stamens or pistils are of three different kinds, generally adapted for cross-fertilization, as in most species of *Oxalis*. 2. Species having three forms of animals, as in the sexual trimorphism of certain butterflies, in which males and two sorts of females are present. Essentially the same is true of bees, the workers being infertile females.

Trimountain. Earliest name of Boston, from the three summits of Beacon Hill. The name Boston was adopted Sept. 7, 1630, Old Style.

Trimurti. Hindu trinity, represented as one body with three heads, Brahma the creator in the middle, Vishnu the preserver on the right, Siva the destroyer on the left.

Trinacria. Sicily; supposed to be so called from its triangular shape.

Trine. In Astrology, aspect of two planets when 120° or one-third of a circumference apart.

Trinidad. Island off n.e. coast of Venezuela; discovered by Columbus 1498; settled by Spaniards 1532; held by Gt. Britain since 1797. The soil is extremely fertile and is seldom subject to drought. It exports sugar, molasses, cacao, coffee, fruit, and asphalt. La Brea is an asphalt lake of 100 acres. Port of Spain is the only harbor of commercial importance. Area 1,754 sq. m.; pop., 1891, 208,030.

Trinidad—Digging Asphalt.

Trinidad. Town on s. coast of Cuba. Pop. ab.30,000.

Trinitarians. 1. Believers in the Trinity. 2. Order founded 1197 to ransom Christian captives held by Mohammedans or pagans. See REDEMPTIONISTS.

Trinitrocellulose. See NITROCELLULOSE.

Trinitroglycerin. See NITROGLYCERIN.

Trinitrophenol. See PICRIC ACID.

Trinitroresorcin. See STYPHNIC ACID.

Trinity. Deity as existing in three Persons, Father, Son, and Holy Ghost. The doctrine is not formally stated in Scripture (I. John v. 7 being admittedly spurious), but is held by most Christians to be implied there, though denied by Arians, Socinians, and Unitarians.

Trinity Church, NEW YORK. This church was built by the colony of New York 1697, at the instigation of Gov. Benjamin Fletcher, the word Protestant in the Act being construed to mean Episcopal, thus compelling the inhabitants to support the Church of England. The church was enlarged 1735 and 1737, burned 1776, rebuilt 1788, consecrated by Bishop Provost 1791. There were two chapels attached to this church. In 1839 it was demolished for the building of the present church, which was opened 1846; it was designed by Richard Upjohn. The parish includes St. George's in Beekman Street, erected 1752; St. Paul's, Broadway, erected 1766; St. John's, Varick Street, erected 1807; and Trinity Chapel, Twenty-fifth Street, erected 1854. In 1703 a cemetery was donated to Trinity Church by the city and in the same year Queen Anne granted to the church King's Farm, originally the property of the Dutch West India Co., which had been increased by land of Aneka Jans or Jansen, bought from her heirs by the Colonial Government in 1671, one heir failing to join in the conveyance. This land was granted to Roelef Jansen, husband of Aneka, in 1636, by Wouter Van Twiller, Director-general of New Netherlands; it consisted of 62 acres. This grant was the foundation of the wealth of this church, fronting on Broadway, from Warren to Duane Street, thence northwest to Christopher Street and North River, forming an unequal triangle.

Trinity College. At Hartford, Conn.; chartered as Washington Coll. 1823; Episcopal; named Trinity 1845. Its former site is now occupied by the State Capitol, the college having been moved 1878. It has 11 professors, 9 lecturers, ab. 130 students, and a library of 37,000 vols.

Trinity College, DUBLIN. See DUBLIN UNIVERSITY.

Trinity House, CORPORATION OF. On Tower Hill, London; chartered 1514; charged with the licensing of coast pilots, and the maintenance of buoys, beacons, and lighthouses.

Trinity River. In e. Texas. It heads in two forks, and flows generally s.e. to Galveston Bay. Drainage area 17,960 sq. m., length 550 m.

Trinity Sunday. Next after Whitsunday; locally ob-

served from ab.1000, more generally from ab.1200; approved by Popes 1305 and 1334. The Sundays following till Advent are numbered from it.

Trinius, KARL BERNHARD, 1778–1844. German botanist. *Fundamenta Agrostographiæ*, 1820; *Clavis Agrostographiæ antiquioris*, 1822; *De graminibus paniceis*, 1826; *Species graminum iconibus et descriptionibus illustravit*, 1828–36; *Agrostidea*, 1840–41.

Triod. Sponge spicule having three equal rays making equal angles with each other.

Triolein. See OLEINES.

Trionychidæ (SOFT-SHELLED TORTOISES). Family of *Chelonia*, characterized by having the carapace covered with soft skin in place of epidermal plates: the webbed toes have three claws; the body is flat and circular. They are carnivorous, fond of mussels, and burrow in the mud, especially during drought. *Aspidonectes spinifer* has pointed nostrils on a flexible snout: it abounds in salt water creeks. *A. ferox* of the Gulf Coast grows to a length of 18 in. It lays over 60 eggs, and is palatable as food. It is aquatic and carnivorous, destroying many young alligators.

Tripalmitin. See PALMITINES.

Tripe. Dish prepared from the stomachs of sheep or cattle. Plain tripe is the paunch or rumen; honeycomb tripe is the reticulum. See RUMINANTS.

Tripe de Roche. Large, fleshy lichens of the genus *Umbillicaria*, natives of rocky, mountainous regions; sometimes used as food.

Tripestone. Variety of the mineral anhydrite, presenting a peculiar irregular appearance that suggested the name.

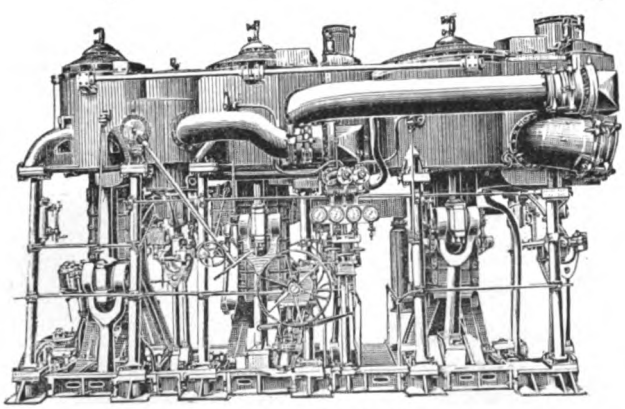
Triphenylmethane. $CH : (C_6H_5)_3$. Solid hydrocarbon, crystallizing in beautiful white plates; mpt. 93° C.; prepared from chloroform and benzene in the presence of aluminium chloride. The amido compounds derived from it are important coloring matters. See PARAFUCHSINE.

Triphenylrosaniline. $C_{38}H_{32}N_3$. Product of the action of aniline upon rosaniline. See SPIRIT BLUE.

Tripitaka. Sacred books of Buddhism, named from their having arranged in baskets the leaves of the palm, in time replaced by written paper.

Triple Alliance. 1. Between England, Sweden and the Netherlands, against France, Jan. 23, 1668. 2. Between England, France and Holland, against Spain and the Pretender, Jan. 1717. 3. Between England, Austria and Russia, Sept. 28, 1795. 4. Between Germany, Austria and Italy, 1883, intended to check Russia and France.

Triple Expansion. Compound engines in which expansion takes place in three cylinders instead of two. Higher



Triple Expansion Engine.

pressures of steam are thus applied, and the recent claims are that the triple forms give an increased economy of 25 per cent over the two-cylinder engines.

Triplicate Ratio. That of the third powers of two quantities.

Triploblastic. Having three layers in the embryo; viz., endoderm, mesoderm, and ectoderm, as in most *Metazoa*.

Triplopy. See DIPLOPY.

Tripoli. Easternmost of the Barbary States of n. Africa. The surface is low, with a fertile strip along the Mediterranean coast, but arid and sandy in the interior, which is imperfectly known. Area ab.400,000 sq. m. This region was anciently subject to Phœnicians, Cyrenians, Carthaginians, and Romans; was known in the 3d century as Regio Tripolitana, from its three chief cities, then leagued together; was conquered with the rest of n. Africa by the Arabs, and by the Turks 1551; became partly independent 1714, and was made a province of the Turkish empire 1835. It is governed by a pasha, appointed by the Sultan. War with the U. S. was begun 1801, to obtain increase of tribute; the Bashaw was brought to terms by a successful attack on Derne and the bombardment of Tripoli 1806. Pop. ab.1,000,000, chiefly Berbers and Arabs.

Tripoli. 1. Capital of Tripoli; on the Mediterranean, ab. 200 m. e. of the Tunisian boundary. It has a shallow harbor,

Tripoli.

but a large trade with the interior. Pop. ab. 35,000. 2. Seaport of Syria, 40 m. n.n.e. of Beyrout; anciently Tripolis, a Phœnician city; taken by Crusaders 1104, by Mamelukes 1289. Pop. ab. 20,000.

Tripoli, or TRIPOLITE. Diatomaceous earth; rotten stone, in part a decomposed siliceous limestone from which the calcareous portions have been removed, leaving the silica behind; used for the cleaning and polishing of metals. Some tripoli is an aggregation of the siliceous remains of minute animal and vegetable organisms, or infusorial earth.

Tripos. Examination for honors at Cambridge Univ., ab. June 1; covering ten or more subjects.

Tripp, BARTLETT, b.1843. Chief-justice of Dakota 1885; Minister to Austria 1893.

Triptych. Three tablets joined by hinges, to hold a painting or inscription. See DIPTYCH.

Triqueti, HENRI, BARON DE, 1802–1874. French painter and sculptor.

Triquetrous. See TRIGONOUS.

Trirectangular (or TRIQUADRANTAL) **Triangle.** Spherical triangle having all its angles right angles and all its arcs quadrants. It subtends a right trihedral, and is one-eighth the surface of the sphere.

Trireme. Galley with three banks of oars, first used 664 B.C. by Corinthians against Corcyra; it had a crew of 200 men; largest known to the ancients till ab. 350 B.C. Later, five (quiquireme) and even ten rows were used in war vessels.

Trisagion. Greek doxology, found in the Syriac and other liturgies.

Trismegistus. See HERMES.

Trissino, GIOVANNI GIORGIO, 1478–1550. Italian poet, reformer of the alphabet; author of a tragedy, *Sofonisba*, 1524, and an epic, *Italia liberata*, 1548.

Tristan, or TRISTRAM. Legendary nephew of King Mark of Cornwall, and lover of Yseult of Ireland; celebrated by M. Arnold and other poets. The story is of Celtic origin, and existed from 1100 or earlier in various forms.

Tristan da Cunha. Island in s. Atlantic, lat. 37° 6′ S., long. 12° 19′ W.; named from its discoverer, 1506; occupied by England 1817. Area ab. 40 sq. m.; pop., 1895, 61.

Tristearin. See STEARINES.

Tristichous. Three-ranked, as the arrangement of the alternate leaves in the Sedges and some other plants.

Tristram. See TRISTAN.

Tritheism. Belief in three gods; supposed to have been taught, in substance or tendency, by Philoponus in Egypt, ab. 600, and Roscelin in France, 1092, in their anxiety to maintain the doctrine of the Trinity.

Trithemius, JOHANN, 1462–1516. Abbot of Spanheim and Würzburg. Earliest German writer on Ch. history and on shorthand. *Polygraphia*, 1518.

Trithionic Acid. See DITHIONIC ACID.

Triton. In Greek Mythology, son of Poseidon and Amphitrite; marine deity, half man, half fish, who dwells with his parents in a golden palace at the bottom of the sea. He

Triton.

stilled the waves by blowing his shell trumpet. Later poets speak of Tritons as subordinate sea-deities. Pausanias describes them as having sea-green hair and eyes, scales on their bodies, and a dolphin's tail.

Triton. See SALAMANDRINA.

Triton (SEA-SLUG). See AILOBRANCHIA.

Tritozoöid. Zoöid of third generation, produced by a deuterozoöid.

Triumph. Highest honor paid in ancient Rome to a victorious general. He entered the city in a solemn procession, riding in a chariot with four horses. In his train marched his army, with their spoils, the principal captives, and musicians. The general wore a gold-embroidered toga and flowered tunic; his head was crowned with a laurel wreath. He held a laurel branch in his right hand and a scepter in his left. After marching up the Sacred Way, through the Forum, he dismounted, climbed the Capitol Hill, and offered a sacrifice to Jupiter. The festivities closed with a banquet.

Triumvirates, ROMAN. Julius Cæsar, Pompey, and Crassus formed the first, 60 B.C. It lasted 10 years, and was followed by civil war. The second, formed 43 B.C., consisted of Octavius Cæsar, Antony, and Lepidus; Octavius gained absolute power in 31 B.C.

Triurideæ. Natural family of flowering plants, of the class *Angiospermæ* and subclass *Monocotyledons*, comprising 2 genera and ab. 16 species, natives of e. S. America, e. India, and the Malayan Archipelago.

Trivium. Three rays or arms of the starfish, opposite the BIVIUM (q.v.).

Trivium. See SEVEN LIBERAL ARTS.

Troad. Territory of Troy, or Ilium, in n.w. Mysia, Asia Minor. It contained numerous cities. The siege of Troy by the Greeks is said to have occupied 10 years, ending 1184 B.C. The exact site of the city is disputed: Schliemann believed he had discovered it by his excavations at Hissarlik 1871–73.

Trocar. See CANNULA and TAPPING.

Trochal Disk. Expanded region around the Rotifer's mouth, which carries a circle of cilia.

Trochanter. Short ring-like second joint of the insect's leg, counting from the body. It may be in several parts; serves for attachment of muscles, and bears the thigh distally.

Trochee. Foot of one long and one short syllable; basis of trochaic meters.

Trochilidæ. See TENUIROSTRES.

Trochoids. Class of curves generated by a point on the radius, or radius extended, of a circle rolling upon a fixed base; often identified with cycloids, but usually confined to curves traced by points not on the circumference, while cycloids are curves traced by points on the circumference of the moving circle. See PROLATE CYCLOID.

Trochu, LOUIS JULES, 1815–1896. French general 1854; prominent in the Crimea and at Solferino; obnoxious to the emperor through a pamphlet exposing the condition of the army and approving the Prussian system 1867; Gov. and defender of Paris 1870; Deputy 1871–72. *Memoires*, 1896.

Troctolite. Variety of gabbro, composed of white feldspar and dark olivine.

Trœzen. City of e. Argolis, near the Myrtoum Sea; settled in remote antiquity by Ionians: supposed birthplace of Theseus; ally of Athens, and later of Sparta; important till 200 B.C. or later, but long since in ruins.

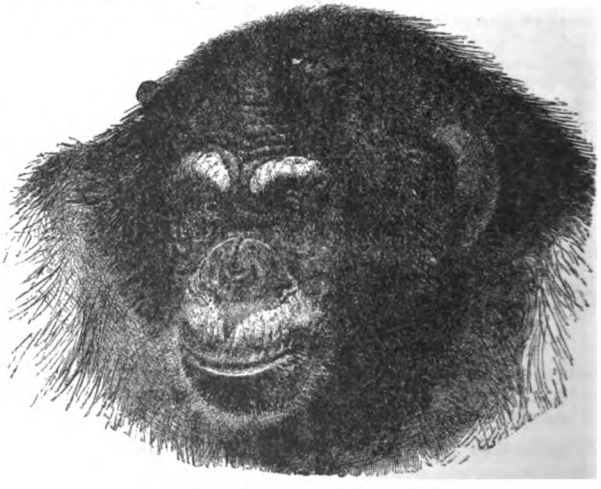
Troglodytes. See ANTHROPOMORPHA.

Troglodytes Gorilla. Largest of the *Anthropomorpha* or man-like Apes. When full grown, the male attains a height of five and a half feet. The canines, muzzle, and superciliary crest become enormously developed. The arms reach to the knees when the animal is erect. It is arboreal, and constructs

Gorilla (*Troglodytes gorilla*).

nests, in which the female brings forth its young. The palms and soles are black and naked, and the three middle digits are united at their bases by the integument. The cranial capacity is ab. 31 cu. in.; that of an Australian is 71 cu. in., and of an average European 93 cu. in.

Troglodytes Niger. Chimpanzee, one of the *Anthropomorpha*, inhabiting w. Africa e. to Abyssinia. The arms are long, and reach to the knees when the animal is erect, which is not its natural position when walking, though assumed at times when at rest. The body is covered with reddish-brown



Chimpanzee (*Troglodytes niger*).

hair, except the hands and face; the face is wrinkled. It lives in societies in forests, constructs nests, and can defend itself against its largest foes. The Bald-headed Chimpanzee is thought to be a distinct species, *T. calvus*. Other species

have been described, but they may be mere varieties. Chimpanzees average a foot shorter in height than gorillas. The nest is used only by the female during confinement. As in gorillas, 13 pairs of ribs are present.

Trogons. Picarian birds, frequenting retired tropical forests; in the Miocene they were more widely distributed. They have a character unique among birds, in that both the first and second toes are turned backward; but these are weak, and not used for climbing. They are schizognathic; ab. 50 species are known. The Old World forms feed on insects, but the New World ones eat fruit, snatching it from the tree while on the wing. They range in size from that of a thrush to a crow. The most brilliant species is the Quesal, with golden green color, black tail and crimson beneath. The male has the middle tail and the wing-coverts lengthened; the former are streamers 3 ft. long.

Trogus Pompeius, ab.40 B.C.–30. Latin author of a universal history in 44 books, of which an epitome by M. Junianus Justinus (2d cent.) survives.

Trolley. Small metallic wheel, fastened to a flexible conductor or trolley pole, which travels in contact with the overhead wire, thus conveying the electric current to the motors on an electric car. See ELECTRIC RAILWAYS.

Trollope, ANTHONY, 1815–1882. English realistic novelist, voluminous and popular; best in his sketches of clerical life, as *The Warden*, 1855, *Barchester Towers*, 1857, and *Last Chronicles of Barset*, 1867. *Autobiography*, 1883.—His mother, FRANCES (MILTON), 1780–1863, caused much wrath by her *Manners of the Americans*, 1832, and pub. several novels.

Trollope, EDWARD, D.D., b.1817. Bp. suffragan of Nottingham 1877; writer on history and architecture.

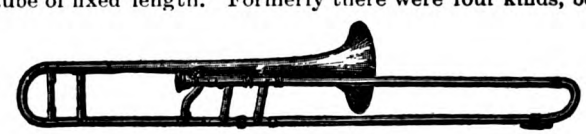
Trollope, THOMAS ADOLPHUS, 1810–1892. English novelist and historical writer, long resident in Florence and Rome; brother of Anthony. *Beppo*, 1864; *The Garstangs*, 1869.—His wife, FRANCES ELEANOR, is the 4th novelist of this family. *Aunt Margaret's Trouble*, 1866; *That Unfortunate Marriage*, 1888.

Trolls. Legendary giants of Scandinavia; dull-witted, and enemies of men.

Tröltsch, ANTON FRIEDRICH, FREIHERR VON, 1829–1890. Prof. Würzburg from 1864; eminent as an aurist. *Anatomie des Ohres*, 1860; *Ohrenheilkunde*, 1862.

Trombidium. Bright-colored Mite, with hairy body, with eyes and tracheal respiration. The young are hexapodous, and are parasitic on Insects, Arachnids, and Mammals.

Trombone. Large trumpet so constructed that its tube can be lengthened, one portion sliding over the other, so as to command a greater range of tones than would be possible in a tube of fixed length. Formerly there were four kinds, bearing the names of the voices, soprano, alto, tenor and bass; the first two are seldom seen now. A double quartet is used at Moravian funerals at Bethlehem, Pa. In a symphony orchestra there are generally three, two tenors and a bass. The instrument is ancient, having been found at Pompeii.



Tenor Trombone.

Trommel. See DRUM.

Tromp, MARTIN HARPERTZOON VAN, 1597–1653. Dutch admiral 1537; victorious over Spanish fleets Feb. and Oct. 1639, and over BLAKE (q.v.) Dec. 10, 1652; said to have sailed up the English Channel with a broom at his masthead; defeated by the British Feb. 28, 1653, June 12–13, and Aug. 8–9; slain in the last action.—His son, CORNELIS, 1629–1691, Admiral 1653, was prominent in several battles, especially 1666 and 1673. He was made an English baron 1675, and succeeded De Ruyter in chief command of the Dutch navy 1676.

Trompe. Water blowing-engine; used as a furnace blast in Europe and America. It can only be used where a fall of water can be obtained, as it is based upon the principle that water falling through a pipe, with an opening in the side, will draw in air, which, by a simple arrangement, can be made to supply a constant blast.

Tromsö. Commercial and fishing port of n. Norway, on e. coast of Tromsö Island, which is one of the most mountainous districts of n. Norway. Whaling expeditions set out from here annually. Pop. 6,100.

Trona. $Na_4C_3O_8+3aq$. Natural hydrous sodium sesquicarbonate, occurring with other similar compounds as an efflorescence or in beds left after the evaporation of salt lakes.

Trondhjem, or DRONTHEIM. Former capital of Norway, on a fiord, 250 m. n. of Christiania; founded 996. Its cathedral, mostly burned 1530, has lately been restored: the choir is old. The town has a good export trade, chiefly dried fish, sulphur and copper. Pop., 1891, 25,051.

Trondhjem.

Troop. Smallest tactical unit of cavalry. In the U. S. service it consists of a captain, 2 lieutenants, 6 sergeants, 4 corporals, 2 trumpeters, 2 farriers, 1 saddler, 1 wagoner, 50 privates: a total of 3 commissioned officers and 66 enlisted men. Four troops form a squadron. In the plural, any body of soldiers.

Troopial, or TROUPIAL. American tropical bird of genus *Icterus*, ab. size of a large robin; black, with beautiful yellow and white markings. It has a clear and pleasing but short whistling song, repeated at intervals.

Troost, GERARD, 1776–1850. B. in Holland; first pres. Phila. Academy of Natural Sciences 1817–21; Prof. of Mineralogy in Phila. Museum 1821; prof. Univ. Nashville from 1828; State geologist of Tenn. 1831–49.

Tropæolines. Sodium salts of compounds formed by the action of phenols upon the diazo compound of sulphanilic acid. They dye wool various shades of orange in an acid bath, and are used as indicators in alkalimetry and acidimetry.

Trope. Figure of speech involving a departure from literal and prosaic truth. Thus metaphor is a trope; simile is not, nor is antithesis.

Trophi. In Insects, parts of the mouth which function in the acquisition of food.

Trophonius, ORACLE OF. In a cave in Lebadeia, Bœotia. Whoever would consult it, drank first of the well of Oblivion, then of that of Recollection, then descended by a ladder and put his feet into an opening in the cave's side and was drawn in bodily by some invisible power. This oracle was highly esteemed, and in Plutarch's time was the only one where responses were given.

Trophoplast. Certain Leucites or Plastids found in vegetable cells; term applied by Meyer.

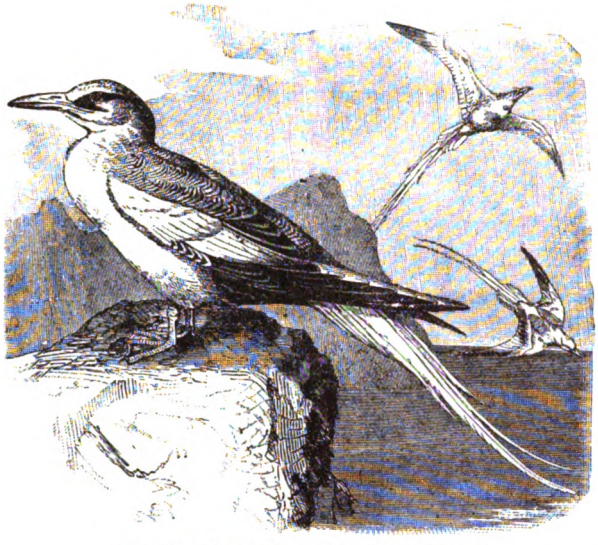
Trophosome. General assemblage of nutritive polyps of a Hydrozoön.

Trophy. Spoils of war, usually armor, set up by the Greeks and Romans on a battlefield, originally at the point where the enemy turned to flight.

Tropical Year. Time required for an apparent revolution of the sun from one equinox to the same. Owing to precession, the arc passed over is a little less than 360 degrees.

Tropic Birds. Three species (Red-billed, Yellow-billed, and White-tailed) of oceanic birds, resembling gulls; but in flight they beat their wings rapidly like ducks. The middle tail feathers are greatly elongated. The young are covered

with pure white down. The female lays a single egg (which is gathered for food in the Bahamas) on cliffs or old trees, with-



Red-billed Tropic Birds (*Phaeton aethereus*).

out making a nest. The Red-billed species is Indian and Pacific; the Yellow-billed has a body as large as a pigeon, and breeds in Bermuda.

Tropics. 1. Two small circles of the celestial sphere, parallel to the equator, and distant from it 23° 27′. That of Cancer is n., that of Capricorn s., of the equator. They are so called from the signs of the Zodiac, which begin at the points where these circles touch the ecliptic. 2. Two similar circles on the earth.

Tropidonotus. See WATER-SNAKES.

Tropine. $C_8H_{15}NO$. Base, mpt. 61° C.; prepared by the decomposing action of acids or alkalies on atropine or hyoscyamine.

Troplong, RAYMOND THÉODORE, 1795–1869. French judge, Peer 1846, Senator 1852. *Code civil expliqué*, 28 vols., 1833–58.

Troppau. Capital of Austrian Silesia; on the Oppa; scene of a futile congress of the powers Oct.–Nov. 1820. Pop., 1890, 22,867.

Trossachs. Glen of Perthshire, celebrated by Scott; much visited by tourists.

Trot. See GAITS and HORSE RACING.

Trott, NICHOLAS, 1663–1740. Judge in S. C. *Laws Relating to Ch. and Clergy*, 1721; *Laws of S. C.*, 1736.

Trotzendorf, VALENTIN. Name given to FRIEDLAND (q.v.); being born at Trotzendorf, Germany.

Troubadours. Knightly, noble, and royal minstrels of France 1000–1300, corresponding to the MINNESINGERS (q.v.) of Germany. The most famous were Raoul de Coucy, King Thibaut IV. of Navarre, ADAM DE LA HALLE (q.v.), and Guillaume Machault.

Trouble. In Mining, any disturbance of regularity in a formation or in a mass of ore, whether produced by faulting or otherwise.

Trough of Low Pressure. Long narrow region or very elongated oval portion of the earth's surface, over which the barometric pressure is lower than on either side. Usually the winds are found blowing toward such belts or troughs over which calms and rains prevail. The equatorial belt is a permanent belt of this kind; minor belts frequently occur in the U. S., lasting for from 1 to 3 days, and closing up into a circular storm center.

Troup, GEORGE MCINTOSH, 1780–1856. M.C. 1807–15; U. S. Senator 1816–19 and 1829–33; Gov. of Ga. 1823–27. During his term the Creeks ceded their lands to the State.

Troup, ROBERT, 1757–1832. American officer; U. S. Dist. Judge for N. Y. ab.1784.

Trousdale, WILLIAM, 1790–1872. Col. in war with Mexico; Gov. of Tenn. 1849–51; Minister to Brazil 1853–57.

Trout. See ISOSPONDYLI and SALMONIDÆ. The Sea Trout is *Salmo trutta*, the Black Spotted Trout is *Salmo fario*, *S. gairdneri* (Steel-head), *S. irideus* (Rainbow Trout), or *S. purpuratus* (Red-throat). The Brook and the Lake Trout are the

1. Atlantic Salmon (*Salmo salar*); 2. Sea or Salmon Trout (*Salmo trutta*).

Chars, including the genus *Salvelinus*, of which the species *S. alpinus*, *S. oquassa*, *S. fontinalis*, and *S. namaycush* are examples. See SALMO and SALVELINUS.

Trouvères. Mediæval poets of n. France. See TROUBADOURS.

Trouville. Seacoast resort of n. France, 10 m. s.w. of Honfleur. Pop. ab. 7,000.

Trover. Legal action for CONVERSION (q.v.).

Trow, JOHN FOWLER, 1810–1886. Printer in New York; publisher of directories from 1849.

Trowbridge, EDMUND, 1709–1792. Judge of Mass. Supreme Court 1767–72.

Trowbridge, JOHN, b.1843. Prof. Harvard since 1880; noted for electrical researches; author of many papers. *New Physics*, 1884.

Trowbridge, JOHN TOWNSEND, b.1827. American novelist, poet, and writer for boys. *Cudjo's Cave*, 1863.

Trowbridge, WILLIAM PETIT, LL.D., 1828–1892. Assistant on U. S. Coast Survey 1857–63; Prof. of Engineering in Yale 1870, and Columbia from 1877. *Heat*, 1874; *Turbine Wheels*, 1879.

Trowel Bayonet. Bayonet shaped like a trowel and intended to be used as an intrenching tool: invented by Lieut. Rice of the U. S. army.

Troy. Capital of Rensselaer co., N. Y., on the e. bank of the Hudson, at the head of steam navigation; 5 m. n. of Albany; founded 1659, incorporated 1816. It has several railroads, two canals, and varied manufactures, especially of iron, shirts, and collars. It is the seat of the Rensselaer Polytechnic Institute. Pop., 1890, 60,956.

Troy. See TROAD.

Troya, CARLO, 1785–1858. Italian historian.

Troyes. City of France, on the Seine, 104 m. e.s.e. of Paris; important in the later Middle Ages. It has a good trade, and cotton and other manufactures. By a treaty concluded here May 21, 1420, Henry V. of England agreed to marry Catherine, daughter of Charles VI., and was recognized as his heir and regent. Pop., 1891, 49,808.

Troyon, CONSTANT, 1810–1865. French painter of landscape and cattle; at his best the equal of any modern landscape painter, and superior of any in animals.

Troy Weight. See POUND.

Trübner, NICHOLAS, 1817–1884. German-English publisher and bibliographer.

Truce. Suspension of hostilities, either general or partial (local), for a definite period, during which each army is to refrain from aggression, and the status quo to be maintained.

Truce, FLAG OF. See FLAG OF TRUCE.

Truce of God. See PEACE OF GOD.

Truck. See BISSELL TRUCK and BOGIE.

Truck System. That of paying wages, in whole or part, in commodities instead of money. It has invariably been found injurious, and has been abolished by law in various countries.

True, CHARLES KITTRIDGE, D.D., 1809–1878. Prof. Wesleyan Univ. 1849–60; biographical writer.

Trueba y Quintana, ANTONIO DE, 1821–1889. Spanish poet and novelist.

True Cross. See HOLY ROOD.

True Reformed Dutch Church. Body which was absorbed into the Christian Reformed Church, 1889, and which had separated from the Reformed Dutch Church in America in 1822. See REFORMED CHURCH.

Truffle. Ascomycetous fungus of subterranean habit, its sporocarps large and highly esteemed for food. There are numerous species, mainly of the genus *Tuber*, most abundant in Europe.

Truffle (*Tuber æstivum*).

Trullan Councils. Held at Constantinople 680, to condemn the Monothelites, and 692 (Quinsext), to supplement the 5th and 6th General Councils; named from a domed hall in the palace.

Trumbull, BENJAMIN, D.D., 1735–1820. Pastor in Conn. *Hist. Conn.*, 1797; *Hist. U. S.* (to 1765), 1810.—His grandson, LYMAN, 1813–1896, was Justice Ill. Supreme Court 1848–53, and U. S. Senator 1855–73.

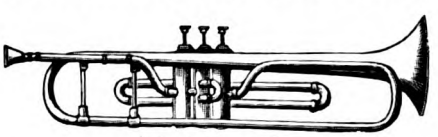
Trumbull, JAMES HAMMOND, LL.D., 1821–1897. Conn. antiquarian and philologist; writer on the Algonquin and other Indian languages.—His brother, HENRY CLAY, D.D., b.1831, sec. Sunday-School Union 1871, and long ed. *Sunday-School Times*, is a prolific writer. *Kadesh-Barnea*, 1884.

Trumbull, JOHN, LL.D., 1750–1831. Poet and essayist; Judge Conn. Superior Court 1801–19. His *McFingal*, 1774–82, a satire, was long popular; some of its lines are still quoted.

Trumbull, JONATHAN, LL.D., 1710–1785. Assistant or Councilor in Conn. 1740–69; Chief-justice 1766–69; Gov. 1769–83; called by Washington "first of patriots" and "Brother Jonathan," whence probably that name as applied to the country.—Of his sons, JOSEPH, 1737–1778, was in Congress 1774–75, and Commissary-gen. of the army 1775–77: JONATHAN, 1740–1809, was army paymaster 1775–80, aid to Washington 1780–83, M.C. 1789–95, Speaker 1791–95, U. S. Senator 1795–96, Lieut.-gov. of Conn. 1796–98, and Gov. from 1798: JOHN, 1756–1843, was in the army 1775–77, and later won fame as a painter, mainly of scenes from the Revolution and portraits of public men. He was long in England, and from 1816 mostly in New York. Four large pictures of his are in the rotunda of the Capitol at Washington. Most of his works, 57 in all, were sold ab.1827 to Yale Coll. for an annuity of $1,000, and are preserved in its museum. His importance is chiefly historical; but for his time he was no mean artist.

Trumbull, JOSEPH, LL.D., 1782–1861. Grandson of Jonathan; M.C. 1834–35 and 1839–43; Gov. of Conn. 1849–50.

Trumpet. Musical instrument of brass, consisting of a tube ab. 8 ft. long, bent on itself for convenience in handling, widening into a bell on one end and terminating in a cup-



Valved Trumpet.

shaped mouthpiece at the other. By means of crooks which vary the length of the tube, it can be set in a large number of keys. It now has valves like the CORNET (q.v.), but formerly it was capable of producing only the tones pertaining to a natural tube. It is the most ancient wind instrument.

Trumpet Creeper, or TRUMPET-FLOWER. *Tecoma radicans.* High climbing vine of the natural family *Bignoniaceæ*, native of the s.e. U. S., bearing showy scarlet flowers and long pods.

Trumpeter. Breed of pigeons, so called from the peculiarity of their cooing. The tarsi are well feathered, and the spreading crest overhanging the eyes must be trimmed, so that they can feed their young; white and black are the best colors.

Trumpets. *Sarracenia flava.* Yellow-flowered bog plant, with pitcher-like leaves, growing in bogs in the s.e. U. S.

Trumpet-Tree. *Cecropia peltata.* Tree of the Bread-fruit family, native of tropical America, so called in the W. Indies.

Trumpet-Weed. See JOE-PYE WEED.

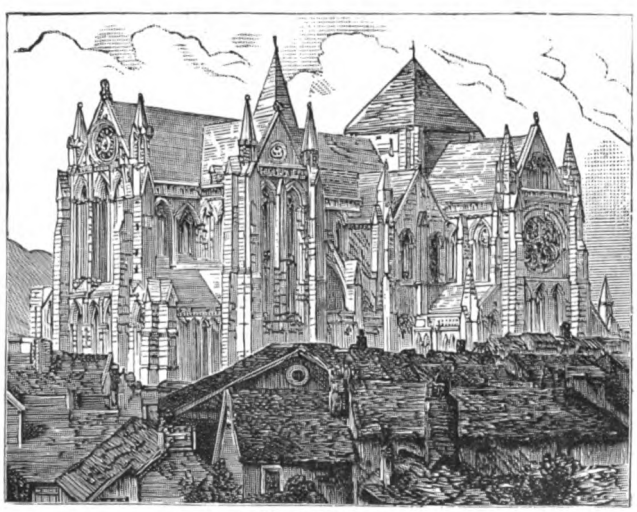
Truncated Cone, or PYRAMID. Part included between the base and a secant plane not parallel to the base.

Truncus Arteriosus. Ventral aorta in Vertebrates from which the aortic arches spring; sometimes divided into a valvular conus arteriosus near the heart and a more distant bulbus arteriosus.

Trunk Engine. Form of steam engine, in which the connecting-rod is pinned to the piston instead of to a crosshead connected by a rod to the piston. To admit of the angular motion of the connecting-rod without leakage of steam at the head of the cylinder, the effective diameter of the piston is reduced by a hollow tube or trunk, whose bore is big enough to admit of the swing of the connecting-rod inside of it, and whose outer surface fits the cylinder head steam tight by means of a stuffing-box. The trunk may be cylindrical, or of an oval shape. The engine is much shortened and compacted in this design, but the power of the two strokes is different, unless a second trunk is used on the other side, when the piston and cylinder become annular.

Trunk-Fish. See PLECTOGNATHI.

Truro. Old town of Cornwall, on an inlet, 12 m. n.n.e. of Falmouth, on a peninsula, at the junction of rivers Allen and



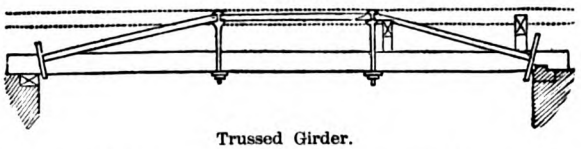
Truro Cathedral.

Kenwyn. T. was formerly an important mining town, in a region of tin and copper mines; seat of a former bishopric, revived 1876. Pop., 1891, 11,131.

Truro, THOMAS WILDE, BARON, 1782–1855. M.P. 1831 and later; knighted 1840; Atty.-gen. 1841; Chief-justice of Common Pleas 1846; Baron 1850; Lord Chancellor 1850–52.

Truss. System of members consisting of an upper chord, a lower chord, and webbing, so arranged that each is strained only in tension or compression; everywhere used for roofs and bridges. The first trusses were employed in Italy and Germany in the 13th century, but the scientific method of arrangement was little studied until ab.1830. The first satisfactory theoretic discussion of the stresses in bridge trusses made in the U. S. was pub. by Whipple 1847. The Howe truss, introduced 1840, the Whipple 1850, the Pratt 1855, are those most extensively used for simple bridges. The stresses in the chords decrease, while those in the webbing increase, as the depth of the truss

is made greater; the economic depth is that which requires the least quantity of material. The word is not applicable to



Trussed Girder.

a structure which exerts a horizontal pull or thrust upon its supports.

Truss Bridge. One deriving its supporting power from trusses which bring only vertical pressures on the piers. See BRIDGE and TRUSS.

Trust. Beneficial interest in property, the legal title to which is in another. The owner of such interest is called the cestin que trust, the holder of the legal title, the trustee. This is one of the most important subjects in equity jurisprudence.

Trusts. Trade combinations, in which several previously competing producers enter into an agreement to produce only a certain quantity of goods within a specified time, and to sell these only at a certain price. They have excited much recent attention and opposition in the U. S.

Truth. Fact, reality, whether physical or spiritual; in a narrower sense, agreement of verbal expressions with the thought in the speaker's mind.

Truth, SOJOURNER. See SOJOURNER TRUTH.

Truthfulness. See VERACITY.

Truxtun, THOMAS, 1755–1822. Privateer 1776–82, distinguished in several engagements; Captain U.S.N. 1798. With the *Constellation* he fought and took a French frigate of superior force, *L'Insurgente*, Feb. 9, 1799; and defeated another, *La Vengéance*, Feb. 1, 1800. He left the navy 1802 through a misunderstanding.—His grandson, WILLIAM TALBOT, U.S.N., 1824–1887, served through the Civil War, became Commander 1866, Captain 1873, and Commodore 1882.

Trygon. See RAYS.

Trymberg, HUGO VON, d.ab.1300. German poet.

Tryon, DWIGHT WILLIAM, b.1849. American landscape painter. N.A. 1891.

Tryon, GEORGE WASHINGTON, 1838–1888. Curator Phila. Academy of Natural Sciences 1869, and of its conchological section from 1875. *Shells of N. America*, 4 vols., 1873; *Manual of Conchology*, 12 vols., 1879–85.

Tryon, WILLIAM, ab.1725–1788. Gov. of N. C. 1765–71, and of N. Y. 1771–78; obnoxious for cruelty to prisoners and destructive raids into Conn.; Major-gen. 1777, Lieut.-gen. 1782.

Tryphiodorus. Egyptian-Greek author of uncertain date. His poem on the Falling of Troy survives.

Trypsin. One of the four pancreatic ferments of PANCREATIN (q.v.), which digests proteids. It is the most important of the digestive ferments.

Tsad, LAKE. See CHAD.

Tsar. See CZAR.

Tsaritsin, or ZARITZIN. Town of s.e. Russia, on the Volga. It is surrounded by vineyards, and has flour mills and tanneries. Pop., 1890, 40,130.

Tsarskoye-Selo. Russian town, 14 m. s. of St. Petersburg; site of two summer palaces. Pop. ab.17,000.

Tschaikowsky, PETER ILITSCH, 1840–1893. Russian composer of great versatility, in New York 1891. His chief works are the operas *Woiwode*, 1869, *Opritschnik*, 1874, *Wakula*, 1876, *Eugen Onegin*, 1879, *Maid of Orleans*, 1881, *Mazeppa*, 1882, *Tscharavitschki*, 1886, *Tscharodeika*, 1887, *Piquedame*, 1890, and *Iolanthe*, 1893; two pianoforte concertos, in B-flat major and G minor; symphonic poems, and six symphonies, in G minor, C minor, D major, F minor, E minor, and B minor (*Pathétique*).

Tschermigite. Natural ammonia alum; named from Tschermig, Bohemia, one of the localities at which it has been found.

Tschudi, ÆGIDIUS, 1505–1572. Swiss chronicler. His work, extending to 1470, was pub. 1734–36, and carried on by J. von Müller.

Tschudi, JOHANN JAKOB VON, 1818–1889. Swiss naturalist, in Peru 1838–43; envoy at Vienna 1866–83. *Fauna Peruana*, 1844–47.

Tseng, KWOH-FAN, 1807–1872. Gov.-gen of Kiang provinces.—His son, KI-TSEH, MARQUIS, 1848–1890, was Chinese envoy to England, France, and Russia. 1878–86.

Tsetse (GLOSSINA MORSITANS). S. African fly, destructive to cattle and other animals.

Tsing. Ruling (Manchu) dynasty of China.

T-Square. Flat ruler furnished with a short crosshead, used by draughtsmen for drawing parallel lines.

Tuamotu. Group of coral islands in the s. Pacific, between 14° and 24° S. lat., and 135° and 150° W. long., forming a dependency of the French possession of Tahiti. Called Low Islands by Bougainville, who discovered them, and later named Dangerous Islands by Cook. There are ab. 80 in all, 3 being atolls. Area ab. 330 sq. m.

Tuaregs. Berber tribes of central Sahara; nomadic warriors who exact tribute from caravans; distinguished from the n. Berbers, who are admixed with Arab blood, and w. Berbers, who are shepherds and have the upper part of the body naked; the T. are well clothed and wear a veil wrapped about the head and face, though the women go unveiled. They are Moslems, but monogamy prevails. Some agriculture is practiced on the oases. They hold negro slaves, and have sharp distinctions of caste.

Tuaregs (Tuarics) on Journey.

Tuat. Group of oases, in w. Sahara, s. of Algeria. There is abundance of subterranean water, and the country is very fertile, producing mostly dates.

Tuatara. New Zealand name for the HATTERIA (q.v.).

Tuba. Bass musical instrument, belonging to the valved horns; sometimes called bombardon. Its tube is so long that it is either rolled in a spiral like a horn or bent on itself like a contrabassoon. See SAXHORN.

Tubal Cain. In Genesis, descendant of Cain; inventor of metallurgy.

Tube. Hollow organ formed by the union of sepals, petals, or stamens; also, projection from a germinating pollen-grain.

Tube, DRAWN. Cylindrical tubes for gun-barrels, etc., made without a weld (see PIPE). An ingot or other homogeneous mass of metal is perforated in the center to take a mandrel of the required size. This mass, of short length but considerable thickness, is then reduced by repeated pressures and rollings with reheatings, until its length and thinness has reached the desired limit, when the last mandrel is withdrawn. The process is expensive, but is best adapted for certain classes of work, as in copper and brass.

Tube, IN HYDRAULICS. Hollow cylinder whose length is ab. three times its interior diameter. The amount of water discharged through a tube is ab. 82 per cent of the theoretic amount.

Tube of Force. Space inclosed by lines of force drawn through all the points of contour of a portion of an equipotential surface in a field of force. Its lateral parts are always lines of force, while the ends are always equipotential surfaces.

Tuber. Thickened portion of a rhizome or subterranean stem, generally rendered fleshy by the accumulation of starchy matters, as in the potato.

Tuberaceæ. Order of *Fungi* of the subclass *Ascomycetes*, including the truffles.

Tubercle. 1. Conic or nodular projection or eminence, on the crown of a tooth, near the head of a rib, and elsewhere. 2. Nodular mass of varying size formed in the connective tissues of organs that are attacked by the germ of consumption. See TUBERCULOSIS and BACILLUS TUBERCULOSIS. 3. Wart-like projection on any part of a plant.

Tubercle Bacilli in phthisical expectoration (x ab.1,800 diameters):
a, bacilli; *b*, catarrhal cells.

Tubercular. Having the shape of a tubercle.

Tubercular Meningitis. See MENINGITIS.

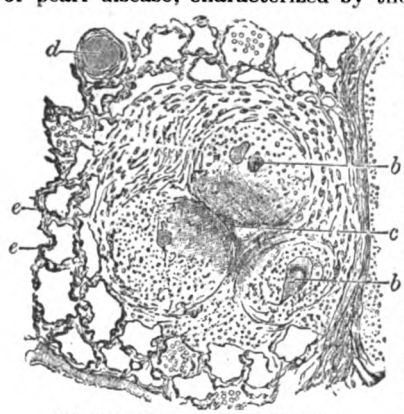
Tubercular Process. In Anatomy, same as the DIAPOPHYSIS (q.v.).

Tuberculate. Surface covered with tubercles.

Tuberculin. See KOCH'S LYMPH.

Tuberculo-Sectorial Teeth. Molar teeth in carnivores, that have sharp-cutting projections in addition to crushing surfaces and tubercles on their crowns.

Tuberculosis. Ordinarily called consumption, phthisis, or pearl disease; characterized by the formation of tubercles on or in various organs, usually the lungs, intestines, and lymphatic glands, the result of irritation produced by the presence and multiplication of the *Bacillus tuberculosis*, a microbe or disease-germ, parasitic in the organ. From one-seventh to one-third of all deaths are due to this disease, which is undoubtedly contracted in all cases, in various ways: (1) as congenital, transmitted to the fœtus by a consumptive mother; (2) by nursing from a diseased mother or taking milk from a consumptive cow (see BOVINE TUBERCULOSIS); (3) by eating food containing germs that have not been killed by exposure to sufficient heat, as in meat from comsumptive animals, or any food exposed to air containing tubercular dust; (4) by breathing tubercular dust. In all cases, certain constitutions (and all constitutions when run down) are especially liable to fall prey to this germ, which in many cases is successfully resisted. The most potent factors aiding in this infection are lack of pure air and sunlight in dwellings, dissipation, and sexual excess. Close inbreeding is considered potent in evolving the consumptive diathesis, but some doubt this. See KOCH'S LYMPH.



Tubercle of Lung (x 50 diameters):
bb, giant cells; *c*, center of tubercle beginning to caseate; *d*, branch of pulmonary artery; *e* alveolar framework of lung.

Tuberose. *Polianthes tuberosa.* Bulbous, fragrant white-flowered plant of the Lily family, native of India, widely cultivated for ornament.

Tuberous. Irregularly thickened roots or subterranean stems, as the Jerusalem artichoke.

Tube Wells. See DRIVEN WELL.

Tubicolæ (TUBICOLOUS ANNELIDS). See SEDENTARIA.

Tubinares. See LONGIPENNES.

Tübingen. Town of Würtemberg, on the Neckar. Its university, founded 1477, had, in 1895, 1,184 students, ab. 100 instructors, and a library of 200,000 vols.

Tübingen School. Founded by F. C. Baur (1792–1860), for the free criticism of Scripture and of Church history. Its influence has been large and somewhat destructive, especially through D. F. Strauss' *Leben Jesu*, 1835–36. An earlier school, led by G. C. Storr (1746–1805), held Evangelical tenets; another was headed by J. A. Möhler (1796–1838), prof. of R. C. theology there.

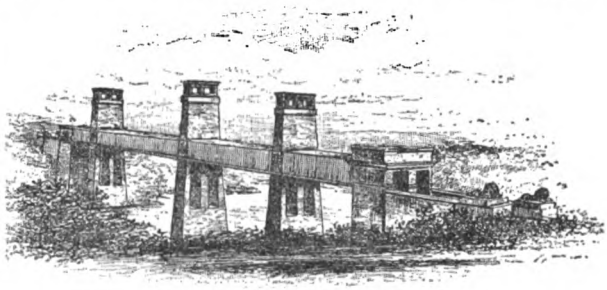
Tubiporidæ. Family of *Alcyonaria*, in which the polyps are placed in parallel calcareous tubes, united by horizontal plates; *e.g.*, Organ-pipe coral.

Tubitelæ, or TUBITELARIÆ. See SPIDERS.

Tubman, HARRIET, b. ab.1821 in Md. Slave, who escaped 1849, and by 1861 had promoted the escape of over 300 negroes.

Tubular. In the form of a tube, as the calyx or corolla of a gamosepalous or gamopetalous flower; also hollow stems.

Tubular Bridge. Wrought-iron bridge having its sides, top and floor made of plate iron riveted together so as to form a rectangular tube, through which trains pass. The longest is the Britannia bridge in Wales, over Menai Straits, which has two spans each 230 ft. long, and two each 460 ft. Tubular bridges are very stiff, but expensive on account of the great amount of materal required. None have been built since 1870.


Britannia Tubular Bridge.

Tubular Bullet. Recent invention of Charles Kruka of Prague and Wm. Hebler of Küssnact, and called the Kruka-Hebler bullet. It is made of steel, having a copper rotating ring attached to the exterior. The hollow tube has a sabot fitting closely to act as a gas check, which drops off after the bullet leaves the gun. This projectile is still in its experimental stage, and it is claimed that an initial velocity of nearly 3,000 f. s. under a gas pressure of 2,650 atmospheres has been obtained.

Tubular Dispatch. See PNEUMATIC DISPATCH.

Tubular Floret. One of the disk flowers in the *Compositæ*, whose corolla is small and regular, in distinction from the ligulate corolla of the ray-flowers.

Tubulariæ (ATHECATA, TÆNIOLATA, GYMNOBLASTEA, CORYNIDA, GYMNOTOKA, OCELLATA, ANTHOMEDUSÆ). *Hydromedusæ* whose polyp-stocks either are naked or have a chitinous periderm, but no cup-shaped hydrothecæ, as in Campanularians. The Medusa-buds are sometimes rudimentary. The sexual cells arise on the manubrium. Four to six ocelli are present at the bases of the tentacles, and correspond in number to the radial canals. The families included are *Clavidæ*, *Hydractinidæ*, *Tubularidæ*, *Corynidæ*, *Eudendridæ*. The group is best termed *Gymnoblastea-Anthomedusæ*.

Tubularidæ. Family of *Tubulariæ* (*Tubularia* being typical). There is a chitinous periderm, and the proboscis has a circle of tentacles, as well as the peristome. The generative buds are sessile and arise between the two circles of tentacles. The branches of the colony arise from a root-like stolon. In *Tubularia* they are much like straws in appearance, slightly branched; at the tip of each is the polyp with its fringes of numerous tentacles. The young pass their embryonic stages in the manubrium of the gonophores.

Tubulosa. Fossil corals with imperfect partitions in their thecæ. See MADREPORARIA.

Tuck, FRIAR. Chaplain of Robin Hood, represented as wearing the Franciscan habit; humorous and combative; introduced by Scott in *Ivanhoe*.

Tuckahoe. Edible, but tasteless fungus, growing on the roots of trees in the s. U. S.; also called Indian Bread.

Tucker, ABRAHAM ("EDWARD SEARCH"), 1705–1774. English author. *Light of Nature Pursued*, 7 vols., 1768–78.

Tucker, CHARLOTTE MARIA ("A. L. O. E."), d.1895. English author of juvenile and religious tales, long a missionary in India.

Tucker, GEORGE, 1775–1861. M.C. from Va. 1819–25; prof. Univ. Va. 1825–45; writer on psychology and political economy; biographer of Jefferson 1837. *Hist. U. S. to 1841*, 4 vols., 1856–58.

Tucker, JOHN IRELAND, D.D., 1819–1895. Rector at Troy, N. Y.; compiler of tune-books, much used in P. E. Ch.

Tucker, JOSIAH, D.D., 1711–1799. Dean of Gloucester, Eng., 1758; writer on political economy. *Commerce and Taxes*, 1753.

Tucker, LUTHER, 1802–1873. Founder and ed. *Genessee Farmer*, 1831, and *Country Gentleman*, 1853.—His son, WILLIS GAYLORD, M.D., became pres. Albany Coll. of Pharmacy 1883.

Tucker, ST. GEORGE, LL.D., 1752–1828. Judge of Va. courts, and of U. S. District Court 1813–27; poet and legal writer; ed. Blackstone 1803. *Slavery*, 1796; *Alien and Sedition Laws*, 1799. —His son, NATHANIEL BEVERLEY, 1784–1851, was judge in Mo. 1816–30, and law prof. William and Mary Coll. from 1834. His *Partisan Leader*, 1836, a romance, was repub. 1861 as *A Key to the Disunion Conspiracy*.—His brother, HENRY ST. GEORGE, LL.D., 1780–1848, was M.C. 1815–19, Chancellor of Va. 1824–31, pres. Va. Court of Appeals 1831–41, prof. Univ. Va. 1841–45, and a writer on law.—His son, JOHN RANDOLPH, LL.D., 1823–1897, M.C. 1875–87, was noted as an orator and lawyer.—A cousin, JOHN RANDOLPH, 1812–1883, was an officer U.S.N. and C. S. N., and in 1866 a Peruvian admiral.

Tucker, SAMUEL, 1747–1833. Seaman of Mass.; Capt. U.S.N. 1776–85; pensioned 1821.

Tucker, TILGHMAN M., d.1859. Gov. of Miss. 1841–43; M.C. 1843–45.

Tucker, WILLIAM JEWETT, D.D., b.1839. Prof. Andover 1879; pres. Dartmouth 1892.

Tuckerman, EDWARD, LL.D., 1817–1886. Prof. Amherst from 1858; lichenologist. *N. American Lichens*, 1845; *Lichens of New England*, etc., 1848.—His cousin, BAYARD, b.1855, wrote several biographies. *Hist. English Prose Fiction*, 1882.

Tuckerman, HENRY THEODORE, 1813–1871. American critic and essayist.—His brother, CHARLES KEATING, 1821–1896, was U. S. Minister to Greece 1868–72.—Their uncle, JOSEPH, D.D., 1778–1840, minister at large in Boston 1826, left his mark on methods of philanthropic work at home and in Europe.

Tucson. Capital of Pima co., and of Arizona 1867–77; on the Santa Cruz; founded by Jesuits 1560; seat of State University. The surrounding country is arid and the climate hot and dry. The prevailing industry is mining. Pop., 1890, 5,150.

Tucuman. City of n. Argentina, 723 m. n.w. of Buenos

Tucuman.

Ayres; founded 1564; scene of a patriot victory 1812, and of the declaration of Platine independence 1816. Pop. ab.40,000.

Tudeschis, NICHOLAS DE (called PANORMITANUS), 1400–1445. Sicilian writer on canon law; Benedictine abbot; Cardinal 1440. His works were collected in 9 vols. 1617.

Tudor. English royal family 1485–1603; descended from Owen Tudor, of Welsh extraction, who married 1423 Catharine of Valois, widow of Henry V. Its sovereigns were Henry VII., 1485–1509, Henry VIII., 1509–47, Edward VI., 1547–53, Mary, 1553–58, and Elizabeth, 1558–1603.

Tudor, WILLIAM, 1779–1830. Founder and first ed. *N. American Review*, 1815–18; Consul at Lima 1823; Chargé in Brazil 1827. *Life of Jas. Otis*, 1823; *Gebel Teir*, 1829.—His father, WILLIAM, 1750–1819, was Col. and Judge-advocate 1775–78, and Mass. Sec. of State 1809–10.

Tudor Architecture. Usually applied to late Perpendicular Style, the chapel at Westminster being the most perfect specimen. Tudor flower is an upright flat leaf ornament, used in crests or cornices in Perpendicular architecture.

Tuesday. Day of Mars, the 3d day of the week, so called from Tuesco, a Saxon deity, worshiped on this day.

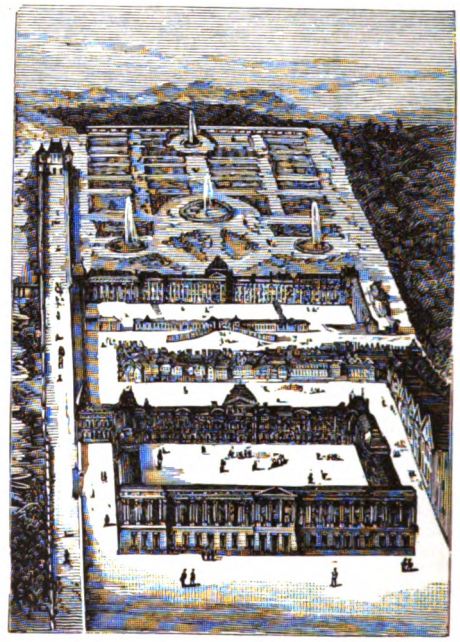
Tufa, or TUFF. Kind of rock characterized by a loose and open structure, formed by the accumulation of volcanic detritus, or by deposition from calcareous or siliceous springs.

Tufts College. At Medford, Mass.; founded 1852, opened 1855; comprising schools of letters, divinity, applied sciences, and medicine; controlled by Universalists; opened to women 1892. P. T. Barnum gave $95,000 to its museum. It has 14 buildings, 40 professors, 30 instructors, 251 students in letters, 35 in theology, 180 in medicine, and a library of 35,000 vols.

Tugenbund. League of Virtue. Formed at Konigsberg in Prussia soon after the Peace of Tilsit, for the revival of morality and patriotism, but really for throwing off the French yoke. Napoleon demanded its suppression 1809. It numbered ab. 400.

Tug of War. English school game, in which sides are chosen, and the opponents, taking the ends of a rope, endeavor to outpull each other; common amusement among schoolboys in Japan, as "rope pulling." It was formerly practiced in Japan between boys of rival villages on the 15th of the 8th month. In Corea it is still played about the 15th of the 1st month. In the country the entire population of districts and villages engage in the sport, and the village that wins expects to have a good harvest.

Tuilleries. Palace in Paris, joined by wings to the Louvre; begun 1564 by Catharine de' Medici, and subsequently much enlarged; stormed by the people 1792, 1830, and 1848; burned by



The Louvre and the Tuilleries (the latter in the background).

Communists 1871; ruins not removed till 1883. The garden, enlarged 1889, now extends over the site of the palace. Napoleon I. and III. resided here, and the kings who came between.

Tuke, DANIEL HACK, M.D., LL.D., 1827–1895. English writer on mental diseases. *Insanity*, 1878; *Dict. Psychological Medicine*, 1892.

Tuke, HENRY, 1756–1814. English writer on Quakerism. *Principles of Religion*, 1805.

Tula. Russian town, on the Upa, 110 m. s. of Moscow. It has large and varied manufactures, especially of arms and niello work. Pop., 1890, 66,111.

Tulane, PAUL, 1801–1887. Merchant of New Orleans, who gave ab. $1,100,000 to found Tulane University.

Tulane University. In New Orleans, La.; founded 1884. The Univ. of La., organized 1878, with all its property and franchises, was merged in it. It has also a medical department, dating from 1834, and a law school 1847. The Newcomb Memorial Coll., founded 1887 for women, has a separate foundation of $500,000, and an attendance of 96. There are 43 professors, 25 assistants, and 940 students.

Tulare Lake. In s. central Cal.; fed by several streams, and partly drained by the San Joaquin. Area ab. 200 sq. m.; formerly much larger.

Tulasne, LOUIS RENÉ, 1815–1885. French botanist, as was his brother, CHARLES, 1816–1884. They wrote chiefly on *Fungi*.

Tulchan Bishops. Scottish clergymen, appointed 1572 to episcopal sees, without consecration or authority, giving nearly all the revenues to lay patrons; so called from the

stuffed "Tulchan calves" used to persuade cows to give their milk.

Tulip. Plants of the genus *Tulipa*, of the Lily family; widely cultivated for ornament in many forms, all supposed to have originated from a single species. It is a native of the Levant and was brought to Augsburg 1559, whence it spread over Europe. A mania for tulips occurred in Holland in the 17th century; they are still much cultivated there.

Tulip Tree. *Liriodendron tulipifera.* Large forest tree of the Magnolia family, bearing large greenish-yellow flowers, native of e. N. America. Locally it is wrongly called Poplar.

Tulip Tree (*Liriodendron tulipifera*).

Tull, JETHRO, ab.1680–1740. English author of a system of improving agriculture by means of thorough culture without manure, exemplified in his *Horse Hoeing Husbandry*, 1733. See LOIS WEEDON.

Tulle. Thin silk fabric, used for trimming gowns, for veils, etc.; named from a French town, where it was formerly made.

Tullianum. Prison in ancient Rome. See MAMERTINE PRISON.

Tullin, CHRISTIAN BRAUNMANN, 1728–1765. Norwegian poet.

Tulloch, JOHN, D.D., LL.D., 1823–1886. Prof. St. Andrews 1854, principal 1860; a leader of liberal thought in the Scottish Church. *Theism*, 1855; *Leaders of the Reformation*, 1859; *Beginning Life*, 1862; *Rational Theology in 17th Century*, 1872; *Modern Theories*, 1884.

Tullus Hostilius. In Roman legends, third king of Rome 672–640 B.C. He destroyed Alba and transferred its inhabitants to Rome upon learning of the Albans' treason, who had acknowledged the supremacy of Rome as a result of the combat between the Horatii and Curiatii, which took place during his reign.

Tully. See CICERO.

Tumbling Lever. See GROUND LEVER.

Tumors. Enlargement or swelling, not the result of inflammation or of normal growth. The older classification of malignant and benign tumors, while not affording a sharp line of demarkation, affords a convenient grouping. Some tumors are of no concern except for the annoyance they may give; others, like the carcinoma, are very liable to terminate fatally. Cartilaginous tumors are composed of tissue similar to cartilage. They rank with the benign tumors. They are found chiefly at the ends of the long bones, especially in the fingers. Treatment is surgical. Benign tumors are abnormal growths, which do not produce constitutional derangement or general illness, except as a result of their pressure or location. They usually grow slowly and do not ulcerate.

Tun. In old wine measure 252 gals.; in old ale and beer measure 216 gals. The ton weight was probably taken from the tun measure, as a tun of water weighed a little more than 2,000 lbs.

Tunbridge Wells. Inland watering place, especially fashionable during the 18th century, 34 m. s.e. of London. Its chalybeate springs were discovered by Lord North in 1606. The local industry is in Tunbridge Ware, a kind of wood mosaic in veneer. Pop., 1891, 27,895.

Tundra. See PLAIN.

Tune. See MELODY.

Tungstates. Salts of tungstic acid.

Tungsten, or WOLFRAM. W. At. wt. 183.6, sp. gr. 19.1, sp. ht. .035. Element first isolated by Elhujar 1785; the oxide was obtained by Bergman and Scheele 1781–82. It occurs in wolframite, tungstite and scheelite. It is obtained by reducing the oxide by hydrogen at a red heat. It is a gray, infusible powder, which burns at a red heat. Introduced into steel in small percentages it gives great hardness for tools and projectiles. The conical points of Holtzer projectiles contain tungsten. Sodium tungstate is used as a mordant, and, with sodium phosphate, renders cloth uninflammable.

Tungsten Chlorides. Dichloride. WCl_2. Soluble, unstable gray substance, made by treating the higher chlorides with nascent hydrogen.—Tetrachloride. WCl_4. Soluble, grayish-brown substance obtained by distilling the pentachloride in carbon dioxide.—Pentachloride. WCl_5. Lustrous black, needle-like crystals; mpt. 248° C.; soluble in carbon disulphide to a blue color; made by distilling the hexachloride in carbon dioxide.—Hexachloride. WCl_6. Black violet crystals; mpt. 275° C. (Cor.); obtained by passing chlorine over the heated metal.

Tungsten Dibromide. WBr_2. Bluish-black compound, obtained by reducing the pentabromide with hydrogen.

Tungsten Dioxide. WO_2. Brown powder; sp. gr. 12.1; made by reducing the trioxide with carbon.

Tungsten Disulphide. WS_2. Black powder, made by melting tungsten with sulphur.

Tungsten Pentabromide. WBr_5. Dark brown needles; mpt. 276° C. (Cor.); obtained by heating tungsten in bromine vapor.

Tungsten Trioxide. WO_3. Tungstic anhydride; lemon-yellow powder, becoming darker on heating; sp. gr. 5.2 to 7.1. It melts in blast-flame, and is made by fusing wolframite with sodium carbonate and nitrate.

Tungsten Trisulphide. WS_3. Liver-brown substance, obtained by fusing wolframite with carbon, sulphur, and soda.

Tungstic Acid. $H_2WO_4+H_2O$. White solid, made by treating POTASSIUM TUNGSTATE (q.v.) with a strong acid; soluble in water. Colloidal tungstic acid is made by dialyzing a 5 per cent solution of sodium tungstate to which hydrochloric acid has been added. It is very soluble in water, forming a mucilaginous mass.

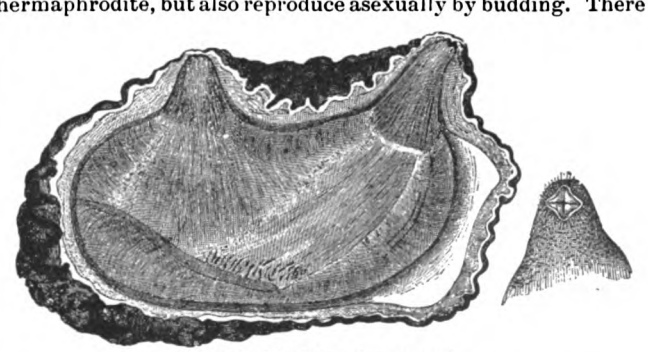
Tungstite. WO_3. Natural tungsten oxide, occurring in small quantity as a yellowish or greenish earthy product of the decomposition of other tungsten minerals.

Tungus. Important branch of the n. Turanians, inhabiting central and part of e. Siberia. The Manchurians are a closely related branch. The Tungus number ab. 80,000, but are disappearing before the encroachments of the Slav from the w. and the Yakut hoards of the n.e. They are considered the most moral of Mongolians. In height they average 5 ft. 4 in.; their figures are slender, their skulls square, mouth large, lips thin, beard scant. They use the reindeer as a beast of burden and for riding, as well as draught. A few are agriculturists, but most are hunters and live by barter in furs. Their food is meat carefully cooked. They are nominally Russian Christians, but at heart Shamanists.

Tunic. Scaly coats of certain bulbs, as the Onion.

Tunic. Shirt or inner garment worn by ancient Romans.

Tunicata (UROCHORDA, ASCIDIOIDEA). Bilateral, barrel or sac-shaped animals, inclosed in a leathery tunic or testa. The anterior portion of the alimentary tract is pierced by openings, forming a branchial sac. The cloacal cavity is continued as an atrial chamber around the branchial basket. The testa has two openings, one, the mouth or incurrent orifice, leading into the branchial sac; the other, the excurrent orifice, leading out of the peribranchial space. Between the two (on the dorsal side) lies the nerve ganglion. A heart is present. The forms are hermaphrodite, but also reproduce asexually by budding. There



Tunicata (*Ascidia microcosmus*).

are two classes: TETHYOIDEA and THALIACEA (q.v.). The development of the embryo Tunicate from the egg shows that these animals, which were once classed as Mollusks, are really closely allied to *Vertebrata*. There is a notochord in the caudal region, which persists in the lowest, least specialized Tunicates. The incurrent pore represents a mouth, and leads into a pharynx, whose walls are pierced by numerous pores representing the gill slits of fishes. The excurrent pore is an external gill opening, like that behind the operculum of a fish, but the cloaca has secured a secondary connection with the atrial or peripharyngeal chamber. Most of the Ascidians are sessile and undergo

a specialization to fit them for such a habit, which from a certain standpoint may be termed a degeneration, so they are degraded Vertebrates, but as much specialized in their way as any Vertebrate.

Tunicate. Provided with a thin, separable covering.

Tunicated Bulb. One whose scales are broad and overlap one another, forming a compact body.

Tuning Fork. Steel rod bent in the form of a U and attached to a steel handle at its center. If the prongs be set in vibration, the sound emitted is of constant pitch, depending upon the length and size of the fork. The fork is often mounted on a resonance box to intensify the sound.

Tunis. One of the Barbary States, of n. Africa, subject to France. It lies between Algeria and Tripoli upon the Mediterranean coast. The n. part is mountainous; the s. is low, some of it being below sea level; through this depression it has been proposed to let the waters of the Mediterranean into part of the Sahara. The country was held in ancient times by Carthage and Rome, in the Middle Ages by Caliphs of Bagdad, and later was governed by its own Beys. It was invaded by Louis IX. of France 1270, and was tributary to Turkey 1575–1871. Since 1881 it has been subject to France. The Bey abdicated 1897 and retired to Nice. Pop. ab. 1,500,000. The capital, T., near the site of Carthage, has some fine buildings, especially mosques and the Bey's palace, varied manufactures, tapestries, leather, soap, cloth, and olive oil, and a considerable trade. Pop. ab. 135,000.

Street in Tunis.

Tunkers. See DUNKERS.

Tunnel. Horizontal passage under the surface of the earth, built for an aqueduct, canal, or railroad. The Romans constructed several in connection with their water supply. The cost is, roughly, ab. $500,000 per mile. The Arlberg tunnel in the Tyrolese Alps is 6½ m. long; opened 1883. The subaqueous tunnel under the Severn for the Great Western Railway is 4⅛ m. long. That under the Mersey is, including approaches, 4½ m. long; opened 1886. The Simplon tunnel, the contract for which was made in Sept. 1893, is to be 12¼ m. long. That under the Hudson River, opposite Jersey City, was partly constructed 1880–86, 1,800 ft. being completed; work was resumed 1889, but again suspended. The north tunnel from the N. J. side is of brick, oval, 16 ft. by 18 ft. high inside, 2,000 ft. long, and beyond of cast-iron, 18 ft. 2 in. diameter, 2,000 ft., with ab. 1,600 ft. to build to reach the shaft; it is 5,680 ft. between the shafts, 5,400 ft. between bulkheads. The top of the tunnel is 14 ft. below the river bed. Lake Fucinus in Italy was drained by a tunnel begun by Claudius, 11 years in building, and ab. 3½ m. long. Prince Torlonia reconstructed this 1854–76, extending it by 2,200 ft., and reclaiming ab.40,000 acres of fertile land. See ADIT, HOOSIC, HUDSON RIVER, MT. CENIS, ST. GOTHARD, and THAMES TUNNELS.

Tunny (ORYCNUS THYNNUS, HORSE MACKEREL). Acanthopterygian fish, which sometimes attains a weight of 1,000 lbs. or more. It lives in the N. Atlantic, and is especially abundant in the Mediterranean, where it is caught in special pounds, several hundred fishermen uniting to raise the net which forms the bottom of the inclosure. On American shores it is caught by harpooning.

Tunstall, CUTHBERT, D.D., 1474–1559. Bp. of London 1522, and of Durham 1530; deprived 1552 and 1559, restored 1553; a learned and moderate prelate, who bore no part in the persecutions under Mary.

Tuomey, MICHAEL, 1808–1857. State Geologist of S. C. 1844, and of Ala. 1848; prof. Univ. Ala. from 1847; author of the geological map of Ala., 1853.

Tupac Amaru, ab.1543–1572. Inca of Peru, executed by the Spaniards.

Tupac Amaru II. (JOSÉ GABRIEL CONDORCANQUI), 1742–1781. Descendant of the Incas; acknowledged by the natives, whom he endeavored to protect. He led a rebellion Nov. 1780, and was put to death with cruel tortures, as were most of his relatives.

Tupac Yupanqui, ab.1420–1483. Inca of Peru 1453. He greatly extended his empire by conquests.

Tupaiidæ (SQUIRREL-SHREWS). Family of *Insectivora*, including the Banxrings of India and the Malay Archipelago.

Tana (*Tupaia tana*).

They have long bushy tails, five-toed, plantigrade, naked-soled feet, and are active both in trees and on the ground.

Tupelo. See PEPPERIDGE.

Tupi-Guarani. Numerous Brazilian Indian tribes, related linguistically. The territory they occupied includes ab. half of S. America. The Caribs of the n. are also closely related. Many of the Amazon tribes are Tupi, with admixed blood of tribes belonging properly outside the Tupi-Guarani stock. Some of these are terrible river-pirates; all are skilled in making arrow-poisons, of which a form of strychnine is the base. Some of the n. Tupi are, or were, cannibals; some compress the heads of infants. Of the central tribes, some tattoo; some were head-hunters, and prepared the heads taken as did the Maori of New Zealand. The mission-work among the s. tribes has fallen into decay since the expulsion of the Jesuits. They had in 1732 over 30 parishes, including 141,000 souls, under parochial, semi-communistic rule. True Tupi-Guarani are of copper-red color, and in disposition silent, patient, torpid. Considerable agriculture is practiced.

Tupper, SIR CHARLES, M.D., D.C.L., b. 1821. Prime Minister of Nova Scotia 1864–67; Canadian Minister of State 1870–73, 1878–84, and 1887–88; Commissioner in London and Baronet 1888.—His son, SIR CHARLES HIBBERT, b.1855, Canadian official, was knighted 1893.

Tupper, MARTIN FARQUHAR, D.C.L., F.R.S., 1810–1889. English author. His *Proverbial Philosophy*, 1838–42, written in unrhymed verse, was immensely popular, but little esteemed by critics. A 3d part appeared 1867. *My Life as an Author*, 1886.

Turan. Anciently, those parts of the Sasanian monarchy which did not belong to Iran, on the north; now sometimes applied to Turkestan. In philology Turanian has been mainly opposed to Aryan, serving as a general term for that family of languages otherwise known as SCYTHIAN (q.v.) and Ural-Altaic, mostly n. and w. of China and Tibet. It includes Mongols, Samoyeds, Hungarians, Turks, Finns, Lapps, etc.; but of late is falling into discredit and disuse.

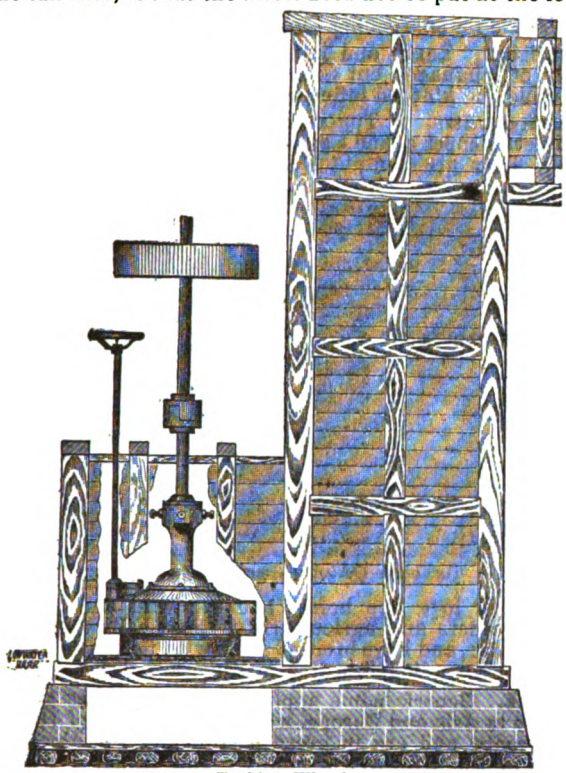
Turbellaria, or PLANARIDA. Free-living Platyhelminths, with flat ovate bodies, covered with cilia. They have a mouth, but no anus, hooks, or suckers. They are divided into the suborders RHABDOCŒLA and DENDROCŒLA (q.v.).

Turberville, GEORGE, ab.1530–1600. English poet and translator. *Faulconrie*, 1575; *Venerie*, 1576.

Turbine. Form of water motor, revolving at a high velocity, and utilizing the impact and reaction upon curved blades of water moving at high speed, due to fall. There are 3 classes: 1st, those receiving water parallel with the axis and discharging in same direction, called parallel-flow wheels; of these the Fontaine and Jonval are historic types, and the Collins is a modern form: 2d, the outward flow, in which the water moves radially outward through guide blades, of which Fourneyron's wheel is the older type, and the Boyden is a modern form: 3d, the inward and downward flow or center-vent wheels, of which the Swain, Leffel, Burnham, Geyelin and Risdon are types. These may be combined. The axis is usually vertical (universally in earlier forms), but recently they have been

TURKEY
IN EUROPE,
GREECE,
ROUMANIA, SERVIA,
MONTENEGRO AND BULGARIA.
Geographical Miles, 60 = One Degree
Turkish Leagues, 22½ = One Degree
English Miles, 69 = One Degree
Longitude East from Greenwich
(To Turkey)
HUNGARY
AUSTRIA
SLAVONIA
BANAT
TRANSYLVANIA
SAXONLAND
EASTERN CARPATHIANS
CARPATHIAN MTS.
MOLDAVIA
WALLACHIA
LITTLE WALLACHIA
BESSARABIA
PODOLIA
MOLDAVIA
BULGARIA
ROUMELIA
THESSALY
EPIRUS
ALBANIA
GREECE
ASIA
MEDITERRANEAN SEA
SEA
Buda or Ofen
Pesth
Szolnok
Szegedin
Gross Wardein
Neusatz
Petelwardein
Temesvar
Old Arad
New Arad
Karlsburg
Hermanstadt
Neumarkt or Maros Vazarhely
Kronstadt
Kimpolung
Waleni
Tirgoviste
Rimnik
Souponest
Pitesti
Bucharest
Duskul
Slobodzie
Urzichoni
Platesti
Tergovisti
Rimnik
Buzeo
Fokchany
Galatz
Braila
Tulcea
Matchin
Babadagh
Hirsova
Kara Kerman
Kilia
Bolgrad
Ismail
Tulcea
Sulina
Mouth of the Danube
Jassy
Roman
Piatra
Bistritz
Niamts
Bakou
Okna
Birlat
Husch
Vaslui
Foltsi
Tekouch
Kirchenaut
Bender
Tiraspol
Girlau
Skouliany
Boluchany
Soutchava
Dorogoie
Tchernovitz
Baja
Belgrade
Semendria
Passarevatz
Bazias
Alt Orsova
Iron Gate
Tchernetz
Zahacz
Paletch
Zvornik
Valjievo
Karlowitz
Gradatchatz
Belina
Screbernik
Maglai
Doboi
Techein
Skender Vakup
Banjaluka
Kliouch
Petrovatz
Jaicza
Doberlin
Dubitza
Gradiska
Derbent
Brod
Novi
Bihaez
Eszek
Prevesa
Sta. Maura
ST. MAURA
ITHACA
Cephalonia
Argostoli
Zante
ZANTE
STRIVALLIS.
Missolonghi
Salona
Leponto
Livadia
Thebes
Thermopylæ
Carpenitze
Patras
Kalavrita
Gastouni
Corinth
Megara
ATHENS
Marathon
Lepsina
Gulf of Lepanto
Nauplia
Argos
Tripolitza
Karytena
Leondari
Acarana
Mistra (Sparta)
Kalamata
Navarino
Modon
Nisi
Monemvasia
C. Malia
CERIGO
CERIGOTTO
C. Spada
C. Melech
Busa
Kisamos
Canea
Suda
Candia
MT. IDA
Sitia
C. Salamone
C. Sidera
SCARPANTO
STANDIA I.
CASO
C. Crio
GOZZO
C. Matala
Sphakia
Gulf of Messara
Gulf of Mirabel
Gulf of Kolokythia
Gulf of Nauplia
Gulf of Coron
Gulf of Eos
Andros
Naxos
Paros
Tinos
Mycone
Syra
Thermia
Hydra
Spezzia
Serpho
Siphanto
Milo
Skino
Polycandro
Santorin
Anaphi
Amorgo
Stampalia
Kos
Rhodes
Scropho
Piscopi
Karki
RHODES
Lero
Calimnos
Levithia
Patmos
Samos
Nicaria
Chio
Kastro
Ipsera
Smyrna
Alashehr
Adin
Guzel-Hisar
R. Menderes
Mania
R. Kydas
Scopelo
Skyros
Pt. Panarmo
Negropont
ANTI PAXO
MT. ORTHYS
M. PARNASSUS
M. HELICON
M. PATMOS
M. CITHERON
M. ANTI MILO
M. SALAMIS
M. ZEA
M. ERYMANTHUS
M. TAYGETUS
M. IDA
M. ORTHYS
C. Colonne
C. Matapan
C. Gallo
C. Malea
C. Sapienza
C. Cabrera
C. Sigeum
C. Mirabel
C. Salamone
C. Sidera
C. Crio
C. Melech
C. Spada
C. Malia
C. Matala
C. Sigeum
R. Danube
R. Drave
R. Save
R. Theiss
R. Koros
R. Maros
R. Temes
R. Aluta
R. Pruth
R. Dniester
R. Kydas
R. Menderes
R. Rufia
R. Arta
R. Bistritz
R. Sereth
R. Jilia
R. Ismail
R. Tulcea
R. Kandra
R. Kilia
R. Sulina
R. Tulcea
R. Matchin
R. Rene
R. Jalonitza
R. Dambovitza
R. Arges
R. Buzeo
R. Tatrus
R. Sereth
R. Pruth
R. Dniester
R. Kydas
R. Menderes
L. Balaton
L. Sasik
L. Tuschkov
L. Kilia
L. Rassein
L. Tchernavoda
L. Oenrusu
L. Tulcea
L. Matchin
L. Sulina
L. Kilia
L. Ismail
L. Tulcea
L. Rene
L. Kilia
L. Sasik
L. Tuschkov

put on horizontal shafts in pairs to avoid the wear of the step which carries the weight of the fluid column in early designs. The draft-tube is an air-tight casing, water-sealed at its bottom in the tail race, so that the wheel need not be put at the lowest



Turbine Wheel.

point of the fall. The efficiency of turbines, according to recent tests, averages 70 to 86 per cent, according to differences in design and in performance at full or partial opening of gate. 87.8 is one of the highest authentic results. The first turbine was devised by Fourneyron in France 1838. They are now used more extensively than all other forms of hydraulic motors. The most powerful ever erected are those installed at Niagara Falls 1895, each wheel furnishing 5,000 horse-power under a head of 136 ft.; the entire plant is intended to include ten such wheels. The cut shows a small wheel and the manner in which it is supplied with water from a penstock. See CENTER FLOW WHEEL.

Turbine, STEAM. Charles A. Parsons of England invented a steam pressure turbine in 1882, which made 10,000 revolutions a minute, with the economic efficiency of a non-condensing steam-engine. The Westinghouse Co. in 1896 built a modification of this turbine, called the Westinghouse-Parsons, for the Nichols Chemical Co. of Brooklyn, N. Y. It is of 300 horse-power and makes 5,000 revolutions per minute. It is 12 ft. long, 2 ft. wide, and 4 to 6 ft. high. It consists of a drum-like shaft, of varying diameter, on which circular rows of inclined blades are mounted; this revolves within a cylinder, in which are circular rows of blades, inclined in the opposite direction to those on the revolving drum; the latter pass between the fixed blades; this secures the effect of expansion and impact of steam from section to section along the shaft. De Laval devised an impulse steam turbine in 1892, which made 30,000 revolutions a minute. The steam is delivered from nozzles upon the face of a wheel, with curved grooves radiating from the center. A 300 horse-power turbine of this form has been made for the Edison Electric Lighting Co. of New York. The wheels are 29.5 in. in diameter, and make 9,000 revolutions per minute. These two turbines are used for running dynamo-electric machines.

Turbot. See HETEROSOMATA.

Turdus. See DENTIROSTRES.

Turenne, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE, 1611–1675. French general of high rank; educated under his uncle, Maurice of Nassau; Marshal 1644; distinguished against Imperialists, Condé, Spaniards, and Montecuculi; killed at Sasbach. *Memoires*, 1782.

Turf. See SOD.

Turgenev, or **Turgenieff,** IVAN, 1818–1883. Russian novelist of highest rank, resident mainly in Paris from 1863. *Annals of a Sportsman*, 1846–51; *Dimitri Rudine*. 1852; *Lisa*, 1858; *On the Eve*, 1861; *Fathers and Sons*, 1861; *Smoke*, 1867; *Virgin Soil*, 1876; *Poems in Prose*, 1883. His works, which are all brief, and bear varying titles in the translations, were the first to reveal the inner life of Russia to w. Europe: they present a singular mixture of satire and sympathy, and are marked by an exquisite style, profound knowledge of human nature, and a gentle but hopeless pessimism.—Of his relatives, ANDREI, 1784–1845, wrote *Historiæ Russiæ Monumenta*, 1841–48; NIKOLAI, 1790–1871, was long in exile, and pub. *Russie et les Russes*, 1847.

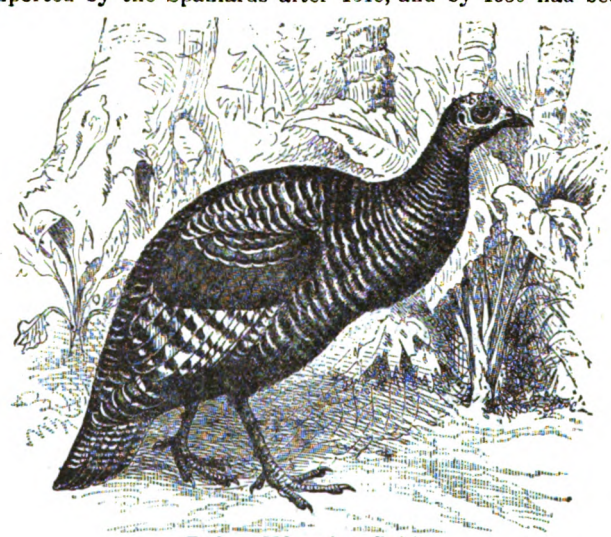
Turgite. $H_2Fe_4O_7$. Hydrous ferric oxide, containing 5.3 per cent of water; much resembling and often occurring together with limonite, and of value as an iron ore. One of its best known American localities is at Salisbury, Conn. The name is of Siberian origin.

Turgot, ANNE ROBERT JACQUES, 1727–1781. French financial reformer and physiocrat. As Intendant of Limoges, 1761–74, he made that province the most prosperous of France. He became Controller-gen. of France 1774, but aroused enmity by his efforts to rectify the inequalities of taxation and to limit privilege, and was dismissed 1776. *Reflexions sur la Formation et la Distribution des Richesses*, 1776; *Works*, 9 vols., 1808–11.

Turin. City of n.w. Italy, at the junction of the Dora Riparia with the Po; ancient Ligurian town, sacked by Hannibal; Roman colony under Julius and Augustus; capital of a Lombard duchy, of Savoy, of Sardinia, and 1861–65 of Italy; held by the French 1506–65, 1640, and 1800–14. It has manufactures of silk and lace, some fine churches, squares, and gardens, several learned societies, and a university, with some 210 instructors, 2,000 students, and a library of ab. 225,000 vols. The growth has been chiefly since 1815. Pop., 1893, 335,900.

Turkestan, RUSSIAN. Region of w. central Asia, held by Russia since 1867. Area 257,134 sq. m.; pop., 1890, 2,670,035, of several races, chiefly Kirghiz and Sarts. The region e., Chinese Turkestan, is thinly peopled and largely desert.

Turkey (MELEAGRIS). American *Phasianidæ* of three wild species; *M. galopavo* (*americana*), with chestnut-tipped tail and wing coverts, wild turkey of U. S.; *M. mexicana*, with buffy white instead of chestnut; and *M. ocellata* of Central America, a gorgeous bird, colored with metallic blue, red, yellow, white, black, etc. The n. turkey may have been exported to England by the Cabots; the Mexican variety was imported by the Spaniards after 1518, and by 1530 had been



Turkey (*Meleagris ocellata*).

thoroughly established as a domesticated variety. By breeding and crossing between the n. and s. forms, the two main breeds of black and variegated are supposed to have arisen.

Turkey, or OTTOMAN EMPIRE. In s. Europe and w. Asia, with dependencies in n. Africa. The surface of European T. is mountainous, the principal range being the Balkans, on the n. Its area is 67,820 sq. m., and pop. ab. 6,000,000. That of Asiatic T. is greatly diversified, comprising high mountains, treeless plains and plateaus, and fertile valleys. Its area is ab. 700,000 sq. m., and pop. ab. 20,000,000. Its culture and industries everywhere are extremely backward. The empire comprises in Europe the s. part of the Balkan peninsula; in Asia, Asia Minor and s. to Suez and Arabia. The Turks belong to the Tataro-Finnic family of the Mongolian race; they originated in the Altai Mts. They subdued Asia Minor 1230–1350, gained possessions in Europe, and attacked Constantinople; were defeated by Tamerlane 1402, but recovered, and under Mohammed II. took Constantinople May 29, 1453; it became his capital. Further conquests followed in Europe and

Asia. Under Solyman I., the Magnificent, ruling 1519–66, the empire attained its culmination. He conquered Hungary, besieged Vienna 1529, and menaced w. Europe. Turkish fleets ruled the Mediterranean till the battle of Lepanto, 1571. Alternating victory and defeat followed, the latter predominating. Vienna was besieged again 1683, but relieved by the Poles. In 1770 Russia advanced her boundaries to the Balkans, assumed a protectorate over Moldavia and Wallachia, annexed the Crimea, and pushed over the Caucasus. This caused another war, in which England and Prussia, alarmed at the rapid expansion of Russia, interfered in behalf of T. From this time dates the singular situation of T. in Europe, her existence being supposed necessary to the equilibrium of the Great Powers. Sympathy with the struggle of Greece for independence, however, led unintentionally to the annihilation of the Turkish fleet by the allies at Navarino 1827. The Czar Nicholas improved the opportunity to assail T., but was forced by the allies to withdraw. A formidable revolt broke out in Egypt under Mehemet Ali, who led his victorious army to Constantinople 1832, but Russia feared the preponderance of French influence and joined the allies against Mehemet, who was forced to give up his conquests. The aggressions of Russia caused the Crimean war 1854, when France and England again defended T. Moldavia and Wallachia united as Roumania 1857, and secured a Hohenzollern prince for ruler. Bosnia and Herzegovina revolted 1875. Russia fomented discord at Constantinople; the Sultan was murdered. Bulgaria, Servia and Montenegro revolted, and in 1877 Russia declared war. T. was without an ally, and although her troops fought with their traditional valor, Russia was victorious and pressed forward to Constantinople. Again the allied powers interfered, and concluded the Treaty of Berlin 1878. Bulgaria became independent, e. Roumelia an autonomous tributary; Austria received Bosnia and Herzegovina; Servia and Montenegro became independent; Russia kept Kars and much adjoining territory. The frightful and repeated Armenian massacres of 1895–96 aroused much indignation in Christendom, but disclosed the inability of the Powers to agree on any action. The war with Greece, 1897, temporarily rehabilitated T. The Turks are valiant warriors, frugal, and capable of enduring great fatigue; religious fanaticism inspired their conquests. They are deficient in administrative capacity, and in peace settle down to sensuous enjoyment. The Porte rules over some of the finest territory of the globe, rich in soil, in mineral deposits, and in valuable timber: it has numerous excellent harbors, but a paralysis is over all. The debt in 1895 was $821,000,000. The Turks are an agricultural people; the business of the empire is in the hands of Greeks, Armenians and Jews. The government is a theocratic absolutism centering in the Sultan. The Vizier is Prime Minister, under whom are the department ministers. The governors of provinces are directly appointed by the Sultan, and the inferior officers are dependent upon them. All officials unite in their persons judicial and executive functions. The administration is exceedingly corrupt. Tripoli was made a province of T. 1835. Polygamy is practiced, and it was long the custom to supply the harem of the Sultan with captured Christians.

Turkey Buzzard. American vulture, resembling the carrion crow, but browner, with rounder tail: in flight it soars

Turkey Buzzard (*Catharista aura*).

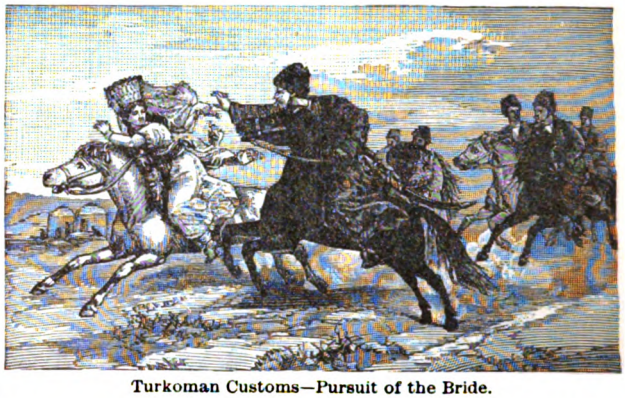
by the hour. Its head and neck are red and naked all round. The plumage is black; length 30 in. It is a voracious scavenger, and ranges from Orange co., N. Y., s. and w. throughout the U. S.; the carrion crow rarely comes as far north.

Turkey-Red Oil. See ALIZARINE ASSISTANT.

Turkey Stone. Fine grained, siliceous rock, from Asia Minor, used for sharpening tools.

Turkish. Large and important branch of the Scythian family of languages, but with a literature greatly influenced by Arabic and kindred influences.

Turkomans, or TURCOMANS. Turkish tribes occupying the desert-steppes e. and s.e. of the Caspian Sea, ab. 1,000,000 in all. They are Sunnite Mohammedans, and recognize no



Turkoman Customs—Pursuit of the Bride.

chief. They love fine horses and are wild and predatory, though breeders and agriculturists. Physically they are thin but muscular, and have bronzed faces with fierce deep-set eyes. Some semi-nomadic tribes of Asia Minor are also so called.

Turks. Generic name applied to several tribes and races of people in Asia and Europe, who speak dialects of the Turkish language and are in great part members of the Turkish division of the Ural-Altaic family. The principal tribes are the BASHKIRS, KIRGHIZ, MONGOLIANS, OSMANLI, TARTARS, USBEKS, and YAKUTS (q.v.).

Turks Islands. Two islands s.e. of the Bahamas: Grand Turk, area 7 sq. m., pop. 2,500, and Salt Cay, area 2¼ sq. m., pop. 700. Chief products are salt from evaporating sea-water, fish, and tortoises. They were annexed to Jamaica 1874.

Turlupinus. Known also as BRETHREN OF THE FREE SPIRIT (q.v.).

Turmeric. *Curcuma longa.* Herb of the Ginger family, native of India; widely cultivated for its tubers, which yield a yellow dye.

Turn Buckle. Double stirrup having a female screw in each end; used to connect the ends of two rods. The threads of the screws being cut in opposite directions, the rods are tightened by turning in one direction and loosened by turning in the other.

Turnbull, LAURENCE, M.D., b.1821 in Scotland. Aural surgeon in Phila. *Diseases of the Ear*, 1881.—His son, CHARLES SMITH, M.D., b.1847, is also a specialist in the same branch.

Turnbull, ROBERT, D.D., 1809–1877. Baptist pastor at Hartford, Conn., 1845–69. *Olympia Morata*, 1842; *Theophany*, 1851.

Turnbull, ROBERT JAMES, 1775–1833. Leader of S. C. nullifiers. His *Crisis* was in that interest.

Turnbull, WILLIAM, U.S.A., 1800–1857. Engineer; designer of the Potomac aqueduct 1832–43.—His son, CHARLES NESBIT, U.S.A., 1832–1874, was an engineer with the Va. armies 1861–65.

Turnbull, WILLIAM BARCLAY, 1811–1863. Scottish antiquary.

Turnbull, WILLIAM PATERSON, 1830–1871. Scottish-American ornithologist. *Birds of e. Pa. and N. J.*, 1869.

Turnbull's Blue. See FERROUS FERRICYANIDE.

Turnèbe, ADRIEN, 1512–1565. Prof. Paris 1547; Greek scholar, praised by Montaigne; editor of sundry classics. *Opera*, 1600.

Turner, CHARLES TENNYSON, 1808–1879. English poet, brother of Lord Tennyson. His name was changed 1835. *Sonnets*, 1864–80.

Turner, CHARLES YARDLEY, b.1850. American painter. N.A. 1886.

Turner, DANIEL, U.S.N., 1794–1850. Active on the lakes 1813–14; Captain 1835.

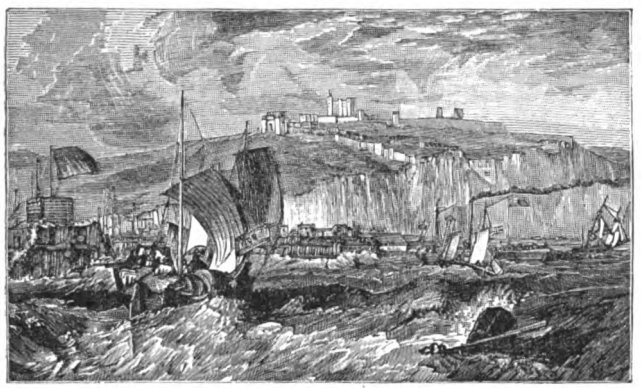
Turner, DAWSON, 1775–1858. English botanist. *British Fuci*, 1802; *Muscologiæ Hibernicæ Spicilegium*, 1804; *Fuci*, 1808–19.

Turner, EDWARD, 1778–1860. Judge Miss. Supreme Court 1824 and 1840–43; Chief-justice 1829–32; Chancellor 1834–39. *Statutes of Miss.*, 1815.

Turner, JAMES, 1766–1824. Gov. of N. C. 1802–5; U. S. Senator 1805–16.

Turner, JOHN WESLEY, U.S.A., b.1833. Brig.-gen. U. S. Vols. 1863–66, serving chiefly in Va.

Turner, JOSEPH MALLORD WILLIAM, 1775–1851. Next to Constable, greatest English painter of his day; a man of great force of character and wonderfully true instincts in art; as a colorist not beyond criticism, but an artist of such power that no work of his can be overlooked or contemned. His later works may be considered rather as problems than as pictures. He amassed great wealth and devoted much of it to the repurchase of his own works, and bequeathed them to the nation, on condition that two of his landscapes should be hung beside two Claudes. The National Gallery has more than 100 of his paintings. A fine example is in the Metropolitan Museum, and two are in the Lenox Library, New York. *The Slave Ship*, now in the Boston Museum, is hardly one of his greatest pictures, though much praised by Ruskin, who once owned it. It was Ruskin's great merit to raise T. to due appreciation by his *Modern Painters*. The famous painter was also a clever etcher



Dover, by Turner.

in his way. He made no attempt to reach the degree of finish then common, but laid in his lines roughly and with force, trusting to the beauty of tone obtained by mezzotinting his plates: thus his etching, with all its masterly power, was little else than rough artistic notes of exceeding excellence. *Æsacus and Hesperia*, is highly prized by the collectors, as is *Devil's Bridge at Altdorf*. His *Liber Studiorum* is well known.

Turner, NAT, 1800–1831. Va. slave, who organized an insurrection 1831: 55 whites were killed and 17 negroes hanged.

Turner, SAMUEL HULBEART, D.D., 1790–1861. Prof. Gen. Theol. Sem. (P. E.), New York, from 1818, and Columbia Coll. from 1831; commentator. *Prophecy*, 1852; *Autobiography*, 1863.

Turner, SHARON, 1768–1847. English historian. *Anglo-Saxons*, 4 vols., 1799–1805; *Hist. England, 1066–1603*, 1814–23; *Sacred Hist. World*, 1832.

Turner, THOMAS, U.S.N., 1808–1883. Commodore 1862; prominent in attacks on Charleston 1863; Rear-admiral 1868.

Turner, WILLIAM, ab.1510–1568. Dean of Wells, Eng., 1550–53 and from 1560; controversial writer and pioneer botanist. *New Herball*, 1551–62.

Turner, SIR WILLIAM, LL.D., D.C.L., F.R.S., b.1832. Prof. Edinburgh since 1867; writer on anatomy.

Turner, WILLIAM WADDEN, 1810–1859. Prof. Union Theol. Sem., New York, 1842–52; Orientalist and translator.

Turneraceæ. Natural order of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 6 genera and ab. 85 species, mostly found in America, from N. C. and Mexico to the Argentine Republic.

Turnicimorphæ. Order of Birds, including paleotropical forms having ægithognathous skulls, straight bill, the upper mandible overhanging the lower at its tip, and the nostrils covered by a linear scale. *Turnix*, in which the hinder toe is absent, is an example.

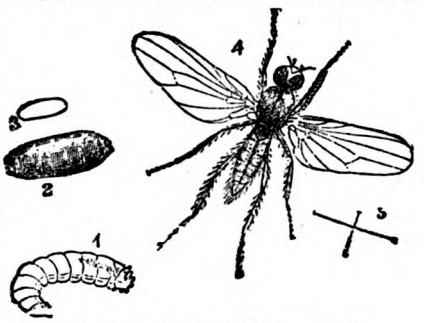
Turning. Process by which a circular shape is given to wood, metal or other hard substance: also of engraving figures composed of curved lines upon a smooth surface. See LATHE, SHAPING MACHINE, and TURRET LATHE.

Turnip. *Brassica campestris*. Biennial, fleshy-rooted herb of the Mustard family, native of Europe; widely cultivated as a food plant in many forms. The common turnip is only occasionally grown in field culture. Many farmers sow turnip seed in their corn at the time of the last cultivation, often getting a fair crop. Turnips, though very watery, are relished by most kinds of stock, and make a desirable adjunct to the winter ration.

Turnip, INDIAN. *Arisæma triphyllum*. Herb of the natural order *Araceæ*, with a hard, dense, intensely acrid corm, native of e. N. America; also known as Jack-in-the-Pulpit.

Turnip, SWEDE. Important in England and Canada; scarcely raised in the U. S., their place being taken by the mangel and sugar beet. When grown, they are cultivated in the same way as the beet, except that they are not sown until June 15 or later.

Turnip Fly. Name given to several insects destructive to turnips. *Anthomyia radicum*, the proper turnip fly, is of the same genus as the cabbage fly and attacks the root of the turnip, as the cabbage fly does that of the cabbage. The larvæ lives in the root. See CABBAGE INSECTS.



Turnip Fly (*Anthomyia radicum*).
1, Maggot (magnified); 2, pupa; 3, natural size; 4, insect; 5, natural size.

Turnout. Side track, connecting with a main track by means of a switch; used to enable trains to pass each other, or for the temporary storage of cars; also called a railway siding.

Turnpike. Road constructed or improved by private parties, who have power to erect gates or pikes for turning back travelers who do not pay toll; kept in better condition than the public roads; first established in England 1346. Although some yet exist in the U. S., the tendency is to bring all roads under state, township, and municipal control. The word is sometimes applied to a macadamized road in a country district. See REBECCA RIOTS.

Turnsol. See LITMUS.

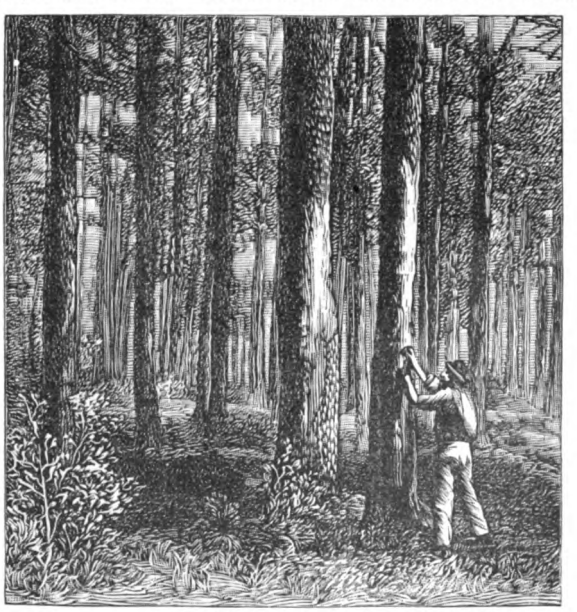
Turnspit. Dog allied to the DACHSHUND (q.v.), and formerly employed to turn the spit upon which meat was roasted.

Turnstone (ARENARIA). Plover, which has the habit of turning over stones to find the molluscan, crustacean, etc., food concealed beneath them. The bill is sharp-pointed, the chest deep black; the head, throat, tail and wing coverts are white; the rest of the plumage is dusky, varied with rufous.

Turntable. Railroad track ab. 100 ft. long, supported on girders and pivoted at the center; used to turn locomotives and cars around. See ROUND-HOUSE.

Turpene. See TERPENES.

Turpentine. Resinous substance secreted in intercellular spaces, as of conifers. Each tree is cut near the bottom so as



Collecting Turpentine.

to form a box, holding ab. one quart of crude turpentine. Each tree is partially stripped of its bark and every two weeks

is cut higher up, the cut being in the form of a V. This is termed hacking, and when it reaches an inconveniently high point the tree is felled and used for timber. The crude turpentine is distilled with water in copper stills having a capacity of from 10 to 60 barrels. The oil is distilled off and the rosin drawn off into barrels.

Turpentine, OIL OF. Bpt. 160° C.; prepared by submitting the exudation from the pine to distillation with water; the oil passes over, rosin remains behind. Its chief constituent is the terpene, pinene, which is a hydrocarbon of the symbol $C_{10}H_{16}$. It is used as a solvent. See TERPENES.

Turpeth, or TURBITH. Root of *Ipomœa turpethum*, found in India and Australia. It contains turpethine, $C_{34}H_{56}O_{16}$, which possesses purgative properties. The root is used as a cathartic.

Turpeth Mineral, or TURBITH MINERAL. Ancient name for the basic sulphate of mercuric oxide, Hg_3SO_6.

Turpie, DAVID, b.1829. U. S. Senator from Ind. 1863 and since 1887.

Turpilius, SEXTUS, d.103 B.C. Author of Latin comedies. Fragments remain.

Turpin, or TILPINUS, d.800. Abp. of Rheims. His name is attached to a *Hist. Karoli Magni*, probably of later date, though approved by a Pope 1122. It was pub, 1566 and later.

Turpin, EDMUND HART, b.1835. London organist, composer of cantatas, masses, and other music, mostly sacred.

Turpin, LOUIS GEORGES FRANÇOIS, 1790–1848. French Commodore 1837, Admiral 1843.

Turpin, PIERRE JEAN FRANÇOIS, 1775–1840. French botanist. *L'inflorescence des Graminées et des Cypérées*, 1819; *Iconographie élémentaire et philosophique des végéteaux*, 1820; *Iconographie végétale*, 1841.

Turpin, RICHARD, 1705–1739. English highwayman, hero of many legends; hanged at York for murder.

Turquoise. $Al_4P_2O_{11}+5aq$. Natural hydrous aluminium phosphate, a little softer than quartz, and with a blue, bluish-green, or green color, due to the presence of copper; not found in crystals, nor in large masses. The Persian turquoise is highly prized as a gem; the mineral from New Mexico, Arizona and Nevada has been similarly used to some extent. Occidental turquoise, bone turquoise, or ODONTOLITE (q.v.), is similar in appearance to the true turquoise, but is of organic origin.

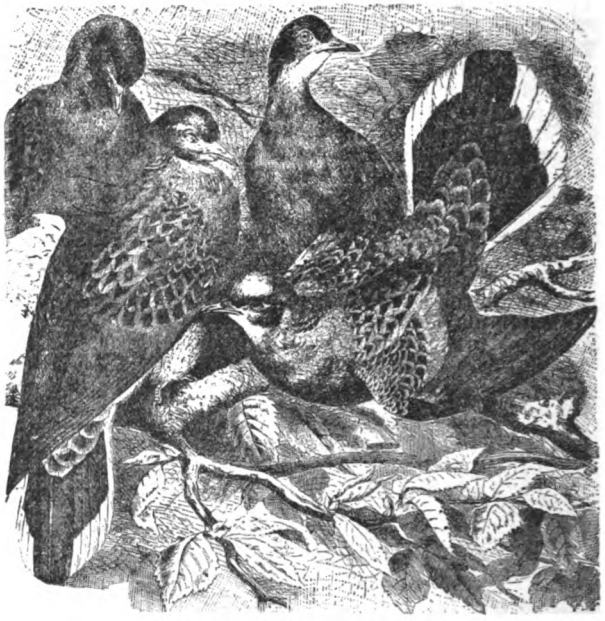
Turretin, FRANÇOIS, 1623–1687. Prof. Geneva 1653; Calvinistic theologian of the strictest type. *Institutio Theologiæ*, 1679–85.—His son, JEAN ALPHONSE, 1674–1737, prof. at Geneva from 1697, held milder views, and strove for union with the Lutherans. *Fundamental Articles*, tr. 1720; *Cogitationes*, 1737. *Works*, 5 vols., 1775.

Turret Lathe. Machine tool much used in manufacturing, to produce numbers of the same article, particularly pins, screws, or studs. The head stock is like an ordinary lathe, with hollow spindle and centering chuck. A rod, of convenient size and section for the pieces to be made, passes through the spindle, is held by the chuck, and revolves with it. The tail stock carries a cylinder in which standardized tools are mounted like guns in a monitor turret: these tools can be presented successively to the work, and are fed by a lever up to stops which gauge length of cut. These tools may be six or more, and may size, turn thread, bore, point, and set for cutting off, without loss of time for measurements or calling for great ability of operator.

Turrets. Small towers used in Gothic architecture for ornament or at the angles as buttresses; they may carry a bell or include a staircase. In the Norman style they are square, in Early English they are polygonal and terminate in spires, and in Perpendicular style they have battlements and pinnacles.—Also revolving towers of iron, containing large guns, for defensive purposes on land or water, invented by J. R. Tirnley 1841. New York Bay is protected in this manner. See TURRET SHIP.

Turret Ship. Species of iron-clad war vessel, on which the guns are carried in one or more iron turrets, which are capable of revolution, so as to bring the embrasure opposite the gun, which is pointed in any direction and temporarily unmasked while firing. Sometimes the turret projects through the deck of an iron-plated war vessel. The monitor has one or two turrets and one or two guns in each turret. It is nearly submerged and the deck overhangs, protecting the rudder and propeller. A monitor was built by J. Ericsson in 1862; plans for such vessels were submitted by him to Napoleon III. 1854, but were rejected. See MONITOR.

Turtle Dove. 1. *Turtur communis.* Timid, gentle dove of Europe, e. Asia, and n. Africa. It walks easily on the ground and perches in trees, can fly at great speed, even through a forest, dodging the trees, shows great attachment for its mate, feeds on seeds, and lays 2 white eggs. 2. American Mourning



Turtle Dove (*Turtur communis*).

Dove, *Zenaidura macroura.* It differs from the American Wild Pigeon in having a bare tarsus, 2 more (14) feathers in the tail, and the plumage brownish olive, glossed with blue and wine-color, with metallic luster. It is 5 in. shorter (12 in.) than the Wild Pigeon. The tail is over 6 in.

Turtle-Head. See BALMONY.

Turtles. See CHELONIA.

Tuscaloosa. Former capital of Ala., and now of Tuscaloosa co.; on the Black Warrior, 55 m. s.w. of Birmingham; seat of the State University and other colleges. Pop., 1890, 4,215.

Tuscan Order. In Architecture; modification of the Doric, adopted by Etrurians or early Romans.

Tuscany. Grandduchy of Italy 1569–1859; ruled by the Medici till 1737. It passed to Sardinia 1860 and to Italy 1861.

Vintage time in Tuscany.

The greater part of the surface is mountainous. The climate is mild and salubrious, except in the Maremma, a marshy dis-

trict along the s. coast. The cultivation of the vine is rapidly extending, but the wine produced is generally of inferior quality, except the Chianti and Montepulciano, which have a high reputation. It is the ancient Etruria. Area 9,300 sq. m.; pop., 1890, 2,274,191.

Tuscaroras. Tribe of s. Iroquois of N. C. They massacred whites 1711: the English, aided by Cherokees, took many of them prisoners, who were sold as slaves. The others rejoined the n. Iroquois, and thus the Five Nations became Six.

Tusculum. Latin city, 15 m. s. of Rome; noted for villas of Cicero (some of whose works were written there) and other eminent men; ruined 1191. Frascati is near its site.

Tushita. Fourth of six Buddhist heavens.

Tuskegee Institute. For colored youth; established 1881 by Booker T. Washington at Tuskegee, Macon co., Ala.; modeled after the school at Hampton, Va. In 1897 it had 79 instructors, 867 students from 19 States, 37 buildings, and 2,460 acres of land, of which 650 were cultivated by the pupils. The property is valued at $300,000. 25 industries are prosecuted by the students, and all but 3 of the buildings were constructed by them, even to the making of the brick and the sawing of the timber. It has done much good, and sent forth missionary teachers to many parts of the South.

Tussaud, MARIE (GROSHOLTZ), 1760–1850. Swiss-French modeler in wax, from 1802 in London, where she established an exhibition of wax figures. It maintains its celebrity, and has been imitated elsewhere.

Tusser, THOMAS, ab.1525–1580. English versifier, whose *Good Husbandrie*, 1557–73, has some historical value.

Tussock. Dense tuft; frequent form of growth of swamp species of grasses and sedges.

Tuthill, LOUISA CORNELIA (HUGGINS), 1798–1879. American writer, chiefly for the young, as was also her daughter, CORNELIA (PIERSON), 1820–1870.

Tutmes. Same as THOTHMES (q.v.).

Tuttle, CHARLES WESLEY, 1829–1881. American astronomer and antiquarian.—His brother, HORACE PARNELL, b.1839, discovered several comets and asteroids. *Pay Tables of U. S. Navy*, 1872.

Tuttle, DANIEL SYLVESTER, D.D., b.1837. P.E. Bp. of Montana 1867, and of Mo. 1886.

Tuttle, HERBERT, 1846–1894. Prof. Cornell from 1881. *German Political Leaders*, 1876; *Hist. Prussia*, 4 vols., 1883–96. Gneist highly esteemed vols. 2, 3, 1884, on Frederick II.

Tuttle, JAMES MADISON, b.1823. Brig.-gen. U. S. Vols. 1862–64.

Tuttle, JOSEPH FARRAND, D.D., b. 1818. Pres. Wabash Coll., Ind., 1863–92; religious and historical writer.

Tutuila. One of the Samoan islands. The harbor Pago-Pago nearly divides it into two peninsulas. Length 11 m., area 15 sq. m.

Tutwork. In Cornish Mining, work in barren ground, dead work, or work paid for at a price independent of the value of the material excavated.

Tver. Russian town, on the Volga, 100 m. n.w. of Moscow. Pop., 1890, 40,962.

Twachtman, JOHN HENRY, b.1853 in Cincinnati. Landscape painter.

Twain, MARK. See CLEMENS.

Twayblade. Orchids of the genera *Listera* and *Leptorchis;* low woodland herbs of the n. hemisphere, bearing two leaves.

Tweed. River of s.e. Scotland, flowing 97 m. e. and n.e. to the North Sea at Berwick; drainage area 1,870 sq. m. Its last 18 m. form the English boundary. It is a noted trout and salmon stream.

Tweed, WILLIAM MARCY, 1823–1878. Politician of New York City; M.C. 1853–55; State Senator 1867–71; Commissioner of Public Works 1870; grand sachem of Tammany Society from 1863; leading spirit of a group of politicians known as the "Tweed Ring," who got control of the finances of the city, and plundered it of many millions. The ring was overthrown in the election of Nov. 1871. T., 1872–73, was arrested, tried, and sentenced to 12 years' imprisonment, on criminal suit, but was discharged by decision of Court of Appeals 1875. He was immediately arrested in a civil suit, and committed to prison for lack of bail, but escaped to Cuba, thence to Spain, whence he was returned 1876. His case was tried and heavy damages obtained against him, which were not paid, and he was confined in Ludlow Street jail until his death.

Twelfth Cake. See TWELFTH NIGHT.

Twelfth Night. Jan. 5. Close of the Christmas holidays, which lasted 12 days; formerly celebrated in England by choosing a king and queen who presided over the festivities until midnight. According to ancient custom, a bean and pea were baked in a cake, which was cut and distributed to the company. The one who received the bean was made king; the receiver of the pea became queen. This and other customs peculiar to the day have mostly fallen into disuse. See EPIPHANY.

Twelve Tables. Earliest code of Roman law, cut on bronze plates and set up in the Forum; the first ten tables were enacted 451 B.C., after study of Greek institutions by a commission. The 11th and 12th, the work of the unpopular second triumvirate, set up 450, are called by Cicero "the two tables of unjust laws." Roman boys in early times learned these laws by heart. The existing fragments of these laws have been several times edited.

Twenty-cent Piece. U. S. silver coin, issued only 1875–78.

Twesten, AUGUST DETLEV CHRISTIAN, 1789–1876. Prof. Kiel 1814, and Berlin from 1835, succeeding Schleiermacher, on whom he wrote. *Logik*, 1825; *Dogmatik*, 1826–37.

Twickenham. Town of Middlesex, on the Thames, 11 m. s.w. of London; residence of Bacon, Pope, and other notables. Pop., 1891, 16,026.

Twiggs, DAVID EMANUEL, U.S.A., 1790–1862. Captain 1815, Col. 1836, Brig.-gen. 1846; distinguished in the Mexican war; dismissed 1861 for surrendering his command and stores in Texas to Confederates; Major-gen. C.S.A. 1861.

Twilight. Caused by reflection of the sun's light from the atmosphere, or from particles of matter floating in the atmosphere. It continues until the sun is about 18° below the horizon.

Twill. Variety of textile goods, in which the weaver gives a sort of diagonal ribbed appearance to the surface. All twilled fabrics present a twill on both surfaces, though reversed in direction. Satin bombazine and kerseymere are varieties of twill.

Twillingate, or TOULINGUET. Port of Newfoundland, on two islands of same name, off n. coast, in 54° 44′ W. long.: the finest Newfoundland dogs come from this district. Pop. 2,8[illegible]0.

Twin Flower. *Linnæa borealis.* Low, creeping evergreen shrub of the natural family *Caprifoliaceæ*, bearing pairs of white flowers, native of the cooler parts of the n. hemisphere.

Twining, THOMAS, 1734–1804. English tr. of Aristotle's *Poetics*, 1789. *Recreations and Studies*, 1883.

Twin-Leaf. *Jeffersonia diphylla.* Low, white-flowered herb of the natural order *Berberideæ*, native of the e. U. S.; known also as Rheumatism-root.

Twirler. See TWISTER.

Twiss, SIR TRAVERS, D.C.L., F.R.S., b.1809. Prof. Oxford 1842–47 and 1855–72; knighted 1867; framer of a constitution for Congo Free State 1884. *International Law*, 1856; *Law of Nations*, 1861–63; *Monumenta Juridica*, 4 vols., 1871–76.

Twisted-Stalk. Herbs of the genus *Streptopus*, of the Lily family, bearing inconspicuous flowers, natives of n. temperate zone.

Twister, or TWIRLER. In w. U. S., tornado, or small revolving storm.

Two-cent Piece. U. S. bronze coin, issued 1864–73; first to bear the motto, "In God we Trust."

Two Old Cat. See ONE OLD CAT.

Tybee Island. In Georgia, at mouth of Savannah river. It is 6 m. long and 3 m. wide, and separated from the coast by Lazarreto Creek.

Tycho Brahe. See BRAHE.

Tycoon. Shogun, or military chief of Japan.

Tydides. Son of Tydeus. See DIOMEDES.

Tye, CHRISTOPHER, d.1572. Church composer; organist of Ely Cathedral 1541–62.

Tylari. Wart-like pads on the underside of the toes of birds.

Tyler, BENNETT, D.D., 1783–1858. Pres. Dartmouth Coll. 1822–28; pres. Theol. Institute, E. Windsor, Conn., from 1834. He maintained the older and stricter views against Dr. N. W. TAYLOR (q.v.) of Yale. *Hist. New Haven Theology*, 1837; *Lectures*, 1859.

Tyler, DANIEL, 1799–1882. Brig.-gen. U. S. Vols. 1862–64, serving in Miss., Va., and Md.

Tyler, JOHN, 1790–1862. Tenth pres. U. S.; M.C. 1816–21; Gov. of Va. 1825–27; U. S. Senator 1827–36; opponent both of U. S. Bank and of Pres. Jackson's measures against it; Whig candidate for Vice-Pres. 1836; elected 1840. He succeeded Pres. Harrison, April 1841, and had a rather stormy term,

John Tyler.

being at odds with most of the Whigs on the Bank question and other matters. Webster alone of Harrison's advisers remained in the Cabinet. From 1845 he was in private life till 1861, when he entered the Confederate Congress.—His son, LYON GARDINER, LL.D., b.1853, pres. William and Mary Coll. since 1888, pub. *Letters and Times of the Tylers*, 1884.

Tyler, MOSES COIT, LL.D., b. 1835. Prof. Univ. Mich. 1867–81, and Cornell since 1881. *Brawnville Papers*, 1868, *Hist. American Literature* (Colonial), 1878; *Patrick Henry*, 1887; *Literary Hist. Revolution*, vol. 1, 1897.

Tyler, RANSOM HEBBARD, 1813–1881. Judge of Oswego co., N. Y. *Law of Infancy*, 1868; *Usury, Pawns, and Loans*, 1873; *Boundaries and Fences*, 1874; *Fixtures*, 1877.

Tyler, ROBERT OGDEN, U.S.A., 1831–1874. Brig.-gen. U. S. Vols. 1862; artillery commander in Va.; disabled at Cold Harbor, June 1, 1864; Brevet major-gen. U.S.A.

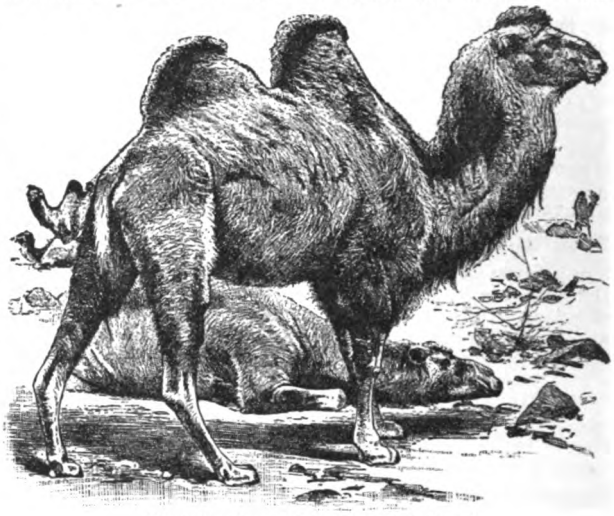
Tyler, ROYALL, 1757–1826. Judge of Vt. Supreme Court 1794, Chief-justice 1800–6; author of three plays, produced 1786–97, a romance, *The Algerine Captive*, 1797, and other works. *Reports Vt. Supreme Court*, 1809–10.—His son, EDWARD ROYALL, 1800–1848, founded *The New Englander*.

Tyler, SAMUEL, LL.D., 1809–1878. Law prof. Columbian Coll., Washington, D.C., from 1867; biographer of R. B. Taney, 1872. *Burns*, 1848; *Progress of Philosophy*, 1858; *Law of Partnership*, 1877. His *Baconian Philosophy*, 1844, won praise from Sir Wm. Hamilton.

Tyler, WAT, d.1381. Leader of a revolt of English peasants, celebrated in Shakespeare's *Richard II.*

Tyler, WILLIAM SEYMOUR, D.D., LL.D., 1810–1897. Prof. Amherst since 1836; editor of Tacitus, 1847–49, and other classics. *Theology of Greek Poets*, 1867; *Hist. Amherst Coll.*, 1873.

Tylopa, or TYLOPODA. This comprises the family *Camelidæ* of the suborder *Selenodontia*, and is characterized by somewhat aberrant peculiarities. There are but two toes to each foot, and the hoof is nail-like. There are no horns, and the upper lip is cleft. The adult has but two incisors in the upper jaw (the young and fossil forms have four or six). There are also canines, and the first premolar is separated by a diastema from the other grinders. The nostrils can be closed at will. The red blood corpuscles are oval. The Old World camels are domesticated, have the toes united by a callous sole, and form two species that are interfertile, the Bactrian Camel of Central Asia and the African or Arabian Dromedary. The former has two humps of fat, the latter only one. These are drawn on for support of life during long fasts of the desert journey. The American forms are also two species, the Guanaco, domesticated as the Llama, of Peru, and the Vicuña, domesti-



Bactrian Camel (*Camelus bactrianus*).

cated as the Alpaca, noted for its wool. They differ from the true camels in having no hump, and in having a separate pad for each toe. See CAMEL, LLAMA, etc.

Tylor, EDWARD BURNETT, LL.D., D.C.L., F.R.S., b.1832. Keeper Oxford Univ. Museum 1883; pres. Anthropological Society 1891. *Mexico*, 1861; *Early History of Mankind*, 1865; *Primitive Culture*, 1871; *Anthropology*, 1881.

Tyloses. Delicate membranes of parenchymatous tissue, found within the vessels of woody plants.

Tylostyle. Spicule of the stylus type with the butt end clubbed (tylote), found in the sponge genus *Placospongia*.

Tylote. Rhabdus knobbed at the ends.

Tympani. See DRUM.

Tympanic Bulla. Projecting capsule of tympanic bone in carnivores.

Tympanic Membrane, or DRUM OF THE EAR. Membrane stretched across the bottom of the external auditory meatus, separating the external from the middle ear. It is closely connected with one of the small bones of the middle ear, and, receiving the sound vibrations, transmits them to the chain of ossicles. It vibrates with the same rapidity as the sonorous body. See EAR.

Tympanum. In Classical Architecture, triangular space between the horizontal and sloping cornices of a pediment.—In Mediæval Architecture, the space between the top of a square doorway and an arch about it; it is generally carved.

Tympanum. Wheel for lifting water, consisting of a horizontal shaft, to which spokes are attached, having buckets at their ends. As the wheel is turned, these buckets dip into water and are filled: later in the revolution they discharge the water at a higher level. Anciently used for drainage and irrigation. Another form consists of an open framed wheel, with curved radial partitions to scoop up the water and deliver it at a higher level.

Tyndale, HECTOR, 1821–1880. Major 28th Pa. 1861: Brig.-gen. U. S. Vols. 1862–64, serving with distinction in Va. and Tenn.

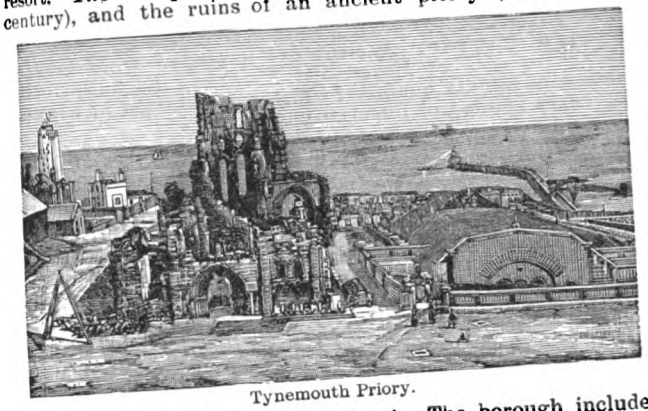
Tyndale, WILLIAM, ab.1484–1536. English reformer and martyr; on the Continent from 1524; imprisoned May 1535; strangled and burned at Vilvorde, S. Brabant, Oct. 6, 1536. His translations of N. T., 1526, and of the Pentateuch and other books, 1530–37, have great merit, and are the foundation of ours. His last words were memorable: "Lord, open the King of England's eyes."

Tyndall, JOHN, LL.D., D.C.L., F.R.S., 1820–1893. Prof. Royal Institution, London, 1853, and its head 1867–83; in the U. S. 1872; pres. British Association 1874; pre-eminent as a writer and lecturer on physics. *Glaciers of the Alps*, 1860; *Mountaineering*, 1862; *Heat as a Mode of Motion*, 1863; *Radiation*, 1865; *Sound*, 1867; *Faraday*, 1868; *Natural Philosophy*, 1869; *Light*, 1870; *Electrical Phenomena*, 1870; *Diamagnetism*, 1870; *Imagination in Science*, 1871; *Fragments of Science*, 1871–92; *Radiant Heat*, 1872; *Forms of Water*, 1872; *Exercise in the Alps*, 1873; *Floating Matter of the Air*, 1881.

Tyne. Branch on the main stem or beam of a deer's horn.

Tyne. River of n. England, flowing 32 m. through a coal region to North Sea; navigable for 18 m.

Tynemouth. Old town at mouth of the Tyne; seaside resort. The antiquities are the gateway of a castle (11th century), and the ruins of an ancient priory (7th century)



Tynemouth Priory.

and its church (11th to 14th century). The borough includes N. Shields and 4 other townships. In Saxon times it was a noted burial place for princes and bishops. Shipbuilding, rope-making and fishing are carried on. Pop., 1891, 46,267.

Tyner, James Noble, b.1826. M.C. from Ind. 1869–75; U. S. Postmaster-gen. 1876–77.

Tyng, Stephen Higginson, D.D., 1800–1885. Rector in Phila. 1829–45, and in New York 1845–78; leading Low Churchman and prolific writer.—His son and namesake, b.1839, was a prominent rector in New York 1863–81, as a brother, Dudley Atkins, 1825–1858, had been in Phila.

Type. Canopy over a pulpit.

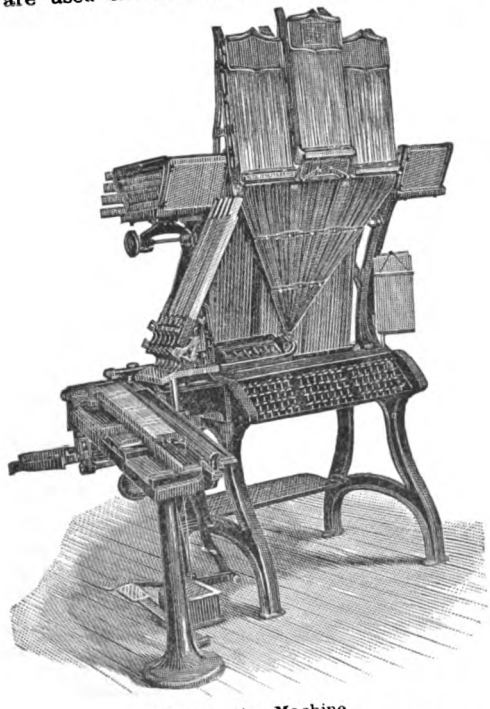
Type. In Biology, etc., perfect individual, exhibiting all essential characteristics of its group.

Type. Prophetic symbol of spiritual truths to be disclosed or developed later, as the O. T. sacrifices of that of Christ. The search for types was carried to great lengths by Origen and other Fathers.

Type-Founding. Art of casting types used in printing. Until ab.1550 printers cast their own type, but from hereon it became a distinct business. A Frenchman named Garomond is the father of letter-founders. W. Caslon established a letter foundry in London 1718. In 1838 David Bruce invented the first successful type-casting machine, which has been improved by various inventors. See Printing, Invention of.

Type Metal. See Antimony, Metallurgy of.

Type-Setting Machines. These are built on two principles and are used extensively in the U. S. and in Europe.

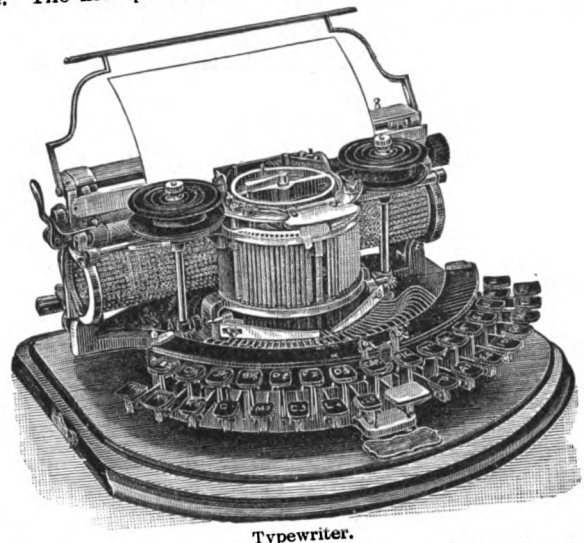


Type-Setting Machine.

One class of machines sets movable types, which are released by operating a key-board, containing the alphabet, and assembles the letters in a long line, to be justified to any desired width. The second class of machines is the Linotype, which assembles the matrixes from which the entire line is cast automatically. Daily newspapers use the latter; for book composition printers prefer the former. A machine for setting type was first invented 1822 by W. Church of England. It is being constantly improved. For distributing the types, each letter has a distinctive nick or nicks on the shank, by means of which a machine distributes each into its proper compartment. 15,000 types have been set in an hour by a machine, one operator setting the line, while another does the spacing.

Type-Specimen. Individual used as a type in preparing the description of a species or group.

Typewriter. Mechanical writing-machine operated by hand and printing a combination of letters, or a single letter at a time. Henry Mill, of England, received the first patent in 1714. The first in the U. S. was invented in 1819 by W. A. Burt of Mich. That invented by Xavier Proyrin of France in 1833 embodied the principles of the modern successful machine. The first practical one, from which the modern Rem-



Typewriter.

ington was developed, was invented by C. L. Sholes, S. W. Soulé, and C. Glidden 1868 in Milwaukee, Wis., and, after extensive experimenting, it was put upon the market as the Remington in 1874; the fundamental principles alone surviving. Since then it has been greatly improved, and many others made, each claiming superiority in one respect or another. See Sholes, C. L.

Typhaceæ. Natural family of flowering plants, of the class *Angiospermæ* and subclass *Monocotyledons*, comprising two genera and ab. 16 species, growing in the waters and marshes of Europe, temperate and tropical Asia, Australia, and the temperate regions of N. America; called the Cat-tail family.

Typhlops. See Opoterodonta.

Typhlosole. Longitudinal fold of the dorsal wall of the intestine of the Earthworm and bivalved mollusks. Its use is to increase the digestive surface.

Typhoid Fever. Name given in 1829 by Louis, a distinguished French physician, to a form of low continued fever constantly accompanied with inflammation and ulceration of the lymph follicles of the intestines. It is an infectious disease caused by a bacillus of the intestines, which has been isolated, the bacillus of Eberth. It is a water borne disease, and the communication is usually through the water supply. It is the most common form of continued fever of temperate climes, and is most common in the autumn. It is a self-limited disease, lasting about six weeks, with a varying mortality rate in different epidemics. The great reduction in the general death-rate from typhoid fever, by the adoption of sanitary precautions, warrants the assertion that it is within our power to prevent every case of it. In 1895 there were 469 deaths from typhoid fever in Philadelphia; with a 10 per cent mortality this indicates a total of 4,690 cases. The deaths from this cause in the U. S. is estimated at 45,000 annually, indicating a total of 450,000 cases.

Typhon, or Typhœus. Monster of the archaic world, represented as a fire-breathing giant, or a destroying hurricane, and 100-headed. He tried to gain dominion over gods and men, but was subdued, and lies in Tartarus, beneath Mt. Ætna.

Typhoon. Violent whirlwind, such as occurs on the coasts of China and Japan, and on neighboring seas; not essentially different from the hurricanes of the Atlantic Ocean. Dr. Morrison says: "At Hainam is a temple dedicated to Tiphon the goddess and to the Mother Kenwoo, in allusion to the storm."

Typhus Fever. Acute disease with a sudden onset and markedly nervous symptoms lasting about two weeks. It is caused by overcrowding, insufficient food and unhealthy surroundings, as is indicated by the various names given to it, famine fever, ship fever, camp fever, jail fever. It is one of the most highly contagious of the fevers, but is not now known in the U. S., except possibly an occasional case in the most congested part of New York City.

Typography. See PRINTING.

Tyr. In Norse Mythology, god of war; son of Odin.

Tyrannidæ. See TYRANT BIRDS.

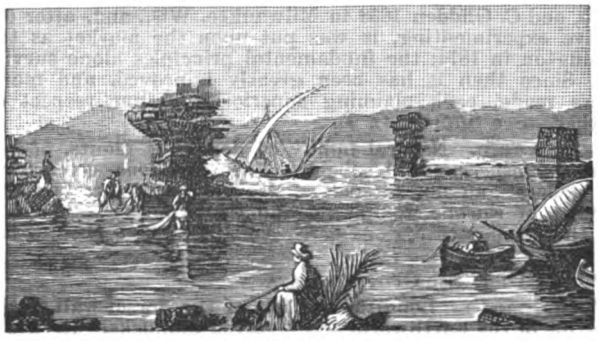
Tyrant. Ruler of an ancient Greek city, who had usurped his power, however he might exercise it.—In popular language, a cruel and oppressive sovereign.

Tyrant Birds (TYRANNIDÆ). Over 350 species, including tyrant chats, tyrant wrens, tyrant flycatchers, peewees, BEE MARTIN (q.v.), etc. They persistently attack other and larger birds. Most are tropical. The bill is hooked at the tip; the general color is grayish olive, with a yellowish wash, strongest on the belly, and a red spot on the top of the head of both sexes, visible when the crest-like feathers are raised. A noted member of this family is the Scissors Tail of Central America, but straying northward. Its body is 4 in. long; the outer tail feathers are 10 in.: they cross from the two sides, and open alternately. It is called the Bird of Paradise in Mexico.

Tyrants, THIRTY. See THIRTY TYRANTS.

Tyrconnel, RICHARD TALBOT, EARL OF, ab.1625–1691. Irish intriguer, banished for conspiracy 1677; created by James II. Earl 1685, commander of the army in Ireland 1686, and Lord-deputy 1687. He replaced the English Protestant officers by Irish Catholics, sought to place Ireland under French protection, supported James after the Revolution, was made Duke 1689, fled to France 1690, and brought French troops to Ireland 1691.

Tyre. Ancient city on the coast of Phœnicia, colonized from Sidon; ancient city on mainland, besieged by Assyrians ab.713 B.C.; taken after 13 years' siege by Nebuchadnezzar and destroyed 572 B.C. A new city on the island was taken after 7



Remains of Fort.

months' siege by Alexander 332 B.C.; captured by Crusaders 1124; destroyed by Selim I. 1516; taken by the French 1799, and by the allied fleet in war with Mehemet Ali 1841. Pop. ab. 5,000. Tyre and Sidon were the two most famous commercial cities of early antiquity, of which Carthage was a colony. They were of Canaanitish race, but mostly in friendly relations with the Hebrews, on whom they depended for food.

Tyrian Purple. Ancient dye prepared from certain mollusks, species of *Murex* and *Purpura*. Each shell-fish contained a minute quantity, which was obtained at a great cost, hence symbol of imperial power.

Tyrol. Province of Austria, between Bavaria and Italy, e. of Switzerland; anciently Rhætia; held by Austria since 1363, except 1806–14. Area 11,324 sq. m. It is mountainous, largely covered with forests, and the residue suitable chiefly for pasturage. Capital, Innsbruck. Pop., 1890, 928,769, mostly German Catholics.

Tyrolite. $Cu_5As_2O_{10}+Aq$. Natural hydrous copper arsenate, greenish or bluish, found in small quantity as one of the products of the alteration of other copper and arsenical minerals.

Tyrone, HUGH O'NEILL, EARL OF, ab.1550–1616. Irish conspirator, Earl 1587. He revolted 1597, defeated the English twice, and offered the sovereignty to Philip II. of Spain, but was defeated with his Spanish allies by Mountjoy 1601. Repeated rebellions led to confiscation of land, dispossession of Catholics, and planting of Protestant English and Scotch in Ulster, 1609–12.

Tyrosine. $C_9H_{11}NO_3$. Silky needles crystallizing in stellate forms, occurring abnormally in the liver and urine, and formed from casein, feathers and albumen by potash fusion.

Tyrotoxicon. Ptomaine extracted from putrid cheese by Vaughan; also formed in milk which has stood for some days. It is very poisonous, producing diarrhœa and vomiting.

Tyrrhenia. See ETRURIA.

Tyrrhenian Sea. W. of Italy, e. of Corsica and Sardinia, and n. of Sicily; part of the Mediterranean.

Tyrtæus, 7th cent. B.C. Greek poet of Attica. Noted for his war songs and elegies, which encouraged the Spartans in their wars with the Messenians. Fragments remain.

Tyrwhitt, THOMAS, 1730–1786. English philologist, editor of Chaucer, 1773–78, the Rowley poems, 1778, and Aristotle's *Poetics*, 1794.

Tyssens, PETER, 1624–ab.1678. Dutch painter.

Tytler, JAMES, 1747–1805. Scottish author, in America from ab.1796.

Tytler, WILLIAM, 1711–1792. Scottish historical writer. —His son, ALEXANDER FRASER, 1747–1813, prof. Edinburgh 1780, Judge-advocate of Scotland 1790, Judge of Session and Lord Woodhouselee 1802, pub. *Elements of History*, 1801, and other books.—His son, PATRICK FRASER, 1791–1849, wrote a valuable *History of Scotland*, 9 vols., 1828–43, and several biographies. —His daughter, SARAH FRASER, has pub. historical novels.

Tzana, or TANA. Fresh water lake on the plateau of Abyssinia, s. of Gondar. The Blue Nile flows into and out of it. It contains many islands, some inhabited. Length 60 m., breadth 30 to 40 m.

Tzarskoye. See TSARSKOYE SELO.

Tzetzes, JOHANNES, 12th cent. Constantinopolitan; Greek poet, whose voluminous works contain much information in a dull and uninteresting form. He quotes a vast number of authors, and treats of many grammatical and literary subjects.

Tzschirner, HEINRICH GOTTLIEB, 1778–1828. Prof. Leipzig 1809; theological writer.

U

Uberti, FAZIO DEGLI, ab.1306–ab.1370. Italian epic and lyric poet, follower of Dante. *Dittamondo*, pub. 1474.

Ubiquitarians. High Lutherans, holding Christ's glorified body to be everywhere in the Eucharist.

Ucayali. River of Peru, rising in the Andes, and flowing generally n. ab. 1,100 m. to the Amazon, of which it is the chief source.

Uccelli, PAOLO, 1396–1475. Florentine painter, celebrated for his interest in perspective. He has frescoes in Maria Novella, Florence, much injured.

Udaipur, or OUDIPUR. Capital of a native Rajput State of e. central India. Pop. ab. 40,000.

Udall, NICHOLAS, ab.1506–1556. Head-master of Eton 1534–43, and of Westminster 1555; author of the first English comedy, *Ralph Roister Doister*, pub. 1565.

Udine, GIOVANNI DA, 1487–1564. Italian painter.

Ueberweg, FRIEDRICH, 1826–1871. Prof. at Königsberg 1862. *Logic*, 1857, tr. 1871; *Hist. Philosophy*, 1863–66, tr. 1871.

Uffenbach, BERNARD VON, 1691–1759. Austrian Jesuit, missionary in S. America 1722–45; historian of the Guarani Indians 1755. *Guarani Lexicon*, 1756.

Uganda. African State, n.w. of Lake Victoria Nyanza; first visited by Speke and Grant 1862; now partly under British influence. Here Bp. Hannington and many native Christians were slain 1885. The people are Bantus, and number ab. 2,750,000; area ab. 50,000 sq. m.

Menga, Capital of Uganda.

Ugolino, d.1288. Count of Gheradesca, podestà of Pisa; was vanquished or betrayed by Abp. Rubaldino, and confined with two sons and two grandsons in a tower, where they perished of hunger. The story is in Dante's *Inferno*, canto 33.

Ugolino, 14th century. Painter of Siena, as were three more of this family.

Ugrians. Mongolians occupying northern Europe at the time of the Slavonic migrations, which separated them into n. and s. branches; now represented by the Finns, Lapps, Samoyeds, and Magyars; originals of the Ogres of mythic child-lore.

Uhland, LUDWIG, 1787–1862. German poet, dramatist, and essayist, notable for scholarship, patriotism, and lyric power.

Uhlans. Prussian lancers, prominent 1870–71 for their bravery and marvelous activity; originally German and other light cavalry, partly Oriental in their accouterments. They are of Asiatic origin and were introduced into the north of Europe by the Tartars, who established themselves in

Uhlans on Reconnaissance Duty.

Poland and Lithuania. An attempt was made to introduce the Uhlans into France in 1734.

Uhlhorn, JOHANN GERHARD WILHELM, 1826–1895. Court preacher at Hanover 1855. *Conflict of Christianity*, 1874, tr. 1879; *Ancient Ch.*, 1881, tr. 1883.

Uhrich, JEAN JACQUES ALEXIS, 1802–1886. French general, active in the Crimea 1854–55; defender of Strassburg, Aug.-Sept. 27, 1870.

Uintahite, or UINTAITE. See GILSONITE.

Uinta Range. In n.e. Utah, trending e. and w., and containing numerous peaks exceeding 13,000 ft. in height; composed mainly of older stratified rocks. Green River cuts a cañon through it.

Uist, N. AND S. Islands of outer Hebrides, 18 and 21 m. long. Pop. ab. 7,200.

Ujiji. African town, on Lake Tanganyika. Here Stanley found Livingstone Nov. 1871.

Ukase. Russian imperial or legislative edict.

Ukraine. E. part of Poland, long defended against Tartars and Cossacks. The portion e. of the Dnieper was ceded to Russia 1686.

Ulbach, LOUIS, 1822–1889. French poet and novelist; ed. *Revue de Paris*, 1853–58. *Gloriana*, 1844; *Mme. Gosselin*, 1878; *Steel Hammer*, 1882; *For Fifteen Years*, 1882.

Ulcer. When inflammatory action has progressed so far that the integument becomes necrosed and is removed forming an open sore, the process is known as ulceration and the product as an ulcer. Ulcers may occur exteriorly, by the breaking

down of the skin; or internally, through the mucous membrane, as an ulcer of the stomach.

Ulema. Collective term, in Mohammedan countries, for persons learned in religious law. They form the legal and judicial class, interpret the Koran, and are the prime movers in fanatical outbreaks.

Ulexite. $NaCaB_5O_9+5aq$. Natural sodium and calcium borate, containing 35.5 per cent of water, very soft and light, occurring in aggregates of fine silky fibers, especially in Chili, where it is known as tiza, and in Nevada in the form of so-called cotton-balls.

Ulfeldt, LEONORA CHRISTINA, 1621–1698. Daughter of Christian IV. of Denmark; wife of an alleged traitor; imprisoned 1663–85. Her narrative was pub. 1869.

Ulfilas, ULPHILAS, or WULFILA, ab. 311–381. Bp. 341; apostle of the GOTHS (q.v.), laboring s. of the Danube from 348. Portions of his notable Gothic Bible exist, chiefly the gospels: for it he invented an alphabet.

Ullmann, JOHANN CHRISTOPH, 1771–1821. Prof. Marburg; author of valuable papers on mineralogy and on the geology of Hesse-Cassel.

Ullmann, KARL, 1796–1865. Prof. Heidelberg 1821–29 and 1836–56; prof. Halle 1829–36; prelate 1856–61. *Gregory Nazianzen*, 1825, tr. 1851; *Sinlessness of Jesus*, 1828, tr. 1841; *Worship of Genius*, 1840, tr. 1846; *Reformers Before the Reformation*, 1840, tr. 1842; *Essence of Christianity*, 1846, tr. 1860.

Ullmannite. NiSbS. Mineral containing ab. 28 per cent of nickel combined with antimony and sulphur.

Ulloa, ANTONIO DE, 1716–1795. Spanish naturalist and astronomer, in Peru with J. Juan 1735–44; historian of this expedition, 1748–72; head of naval school at Cadiz from 1780; founder of a naval observatory and a school of metallurgy.

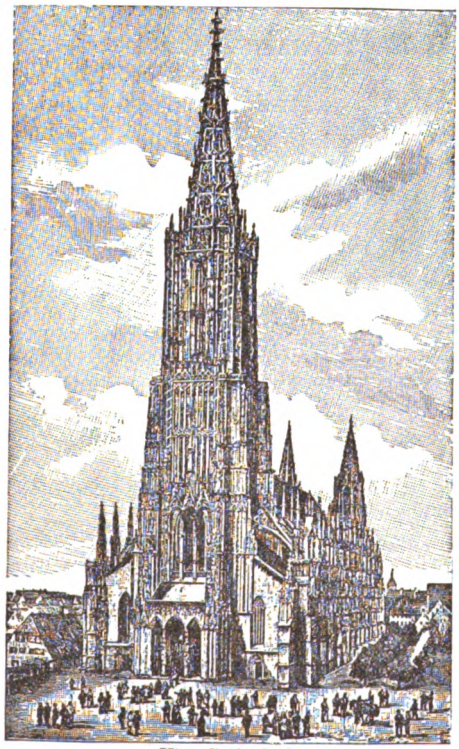
Ulloa, FRANCISCO DE, ab.1485–ab.1540. Spanish officer under Cortes 1520; explorer of the Gulf of California 1539–40.

Ulloa, FRANCISCO DE, ab.1498–1574. Spanish Dominican, missionary in Peru 1538–49 and ab.1551–70.

Ulloa y Pereira, LUIS DE, 1590–1660. Spanish poet.

Ullswater Lake. Between the counties of Cumberland and Westmoreland, Eng.; 9 m. long, 1 m. wide. See LAKE DISTRICT.

Ulm. City of Würtemberg, on the Danube, at the head of navigation. Its fine Lutheran cathedral, built 1377–1494 and



Ulm Cathedral.

restored 1844–90, is 455 by 186 ft., 134 ft. in height, tower and spire 530 ft. high, and an organ with 6,286 pipes, the largest in Germany. Here a peace was concluded July 3, 1620, between Catholics and Protestants; and here Mack surrendered an Austrian army of 30,000 to Napoleon, Oct. 19, 1805. It has manufactures of cotton, woolen, paper, leather and beer. Its ornamental pipe-bowls are noted. Pop., 1890, 36,201.

Ulmic Acid. Product of decaying vegetable matter. Found in earth-mould.

Ulna. Larger of the bones of the forearm, placed on the inner side. It forms, by its articulation with the humerus, the elbow joint, and extends as low as the wrist joint, but does not form a part of it.

Ulotrichaceæ. Small order of green *Algæ*.

Ulotrichi. See MAN.

Ulphilas. See ULFILAS.

Ulpianus, DOMITIUS, ab.170–228. Roman jurist, b. at Tyre; prefect of Prætorian Guards 222; slain by them. Justinian's *Digest* includes 2,462 excerpts from his writings. *Fragmenta*, pub. 1549.

Ulric, ST., ab.890–973. Bp. of Augsburg 923; celebrated for his defense of that city 954; canonized 993.

Ulrich I., 1498–1550. Duke of Würtemberg; twice expelled and restored; active patron of the Reformation.

Ulrici, HERMANN, 1806–1884. Prof. of Philosophy at Halle from 1834; writer on Hegel and Shakespeare. *Logik*, 1852; *Gott und der Mensch*, 1866; *Strauss*, 1873, tr. 1874.

Ultimate End. One to be sought for of itself, and not as a means to some other end; commonly identified in ethics with the Supreme Good.

Ultimate Good. That which is to be sought for as the proper object of reasonable human action.

Ultimate Strength. Force of tension, compression, or shear, which will cause the rupture of a body 1 sq. in. in section under tensile, compressive, or shearing stress. For ductile materials, like wrought iron or soft steel, it is less than the maximum strength, owing to the flow of metal. See STRENGTH OF MATERIALS.

Ultima Thule. See THULE.

Ultimus Hæres. In Law, final heir. The State, which receives the property of those who die intestate, without leaving next of kin.

Ultramarine. Blue coloring matter, occurring in nature as LAPIS-LAZULI (q.v.); made in large quantities by melting kaolin, sulphur and dry sodium carbonate, or clay, calcined sodium sulphate and charcoal. A number of ultramarines are now on the market; a red, a yellow, a white, a green, and a number of blue varieties are known.

Ultramontanism. Italian theories ascribing doctrinal infallibility and a universal episcopate, with ordinary and immediate authority, to the Pope. Both articles were established as necessary to Catholic faith by the Vatican Council 1870. The opposing principle was that of a national church, as Gallicanism.

Ultra Red. See DARK HEAT.

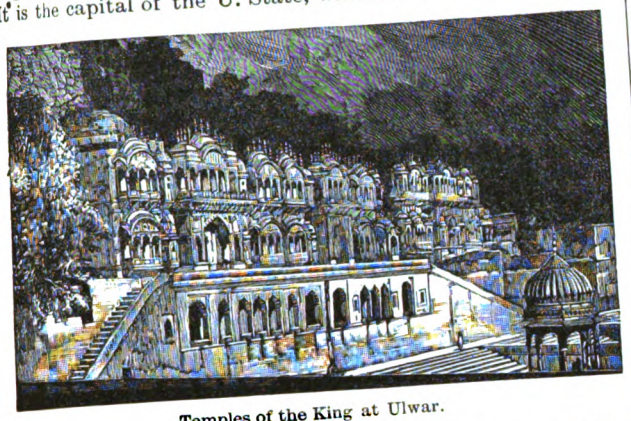
Ultra Violet. That part of the solar spectrum which is more refrangible than the visible violet. This invisible stretch beyond the violet comprises a very large part of the total spectrum and may be studied by receiving it on some fluorescent surface, as a piece of paper which has been dipped in a solution of sulphate of quinine.

Ultra Vires. Act beyond the legal authority of a corporation. An ultra vires contract is unenforceable, but if it has been executed by one party, the other may be liable on a quasi-contractual obligation. The term is inapplicable to torts of corporations.

Ulugh Beg, 1394–1449. Grandson of Timur-Lenk; prince of Samarkand 1447; murdered by his eldest son. He is more widely known as an astronomer than as prince, his most enduring work being a catalogue of 992 stars, the first of the kind attempted since the time of Ptolemy. It is accompanied by an introduction which throws much light upon the methods then in use.

Ulvaceæ. Order of green *Algæ*, including the sea-lettuce.

Ulwar. Town of India, 85 m. s.w. of Delhi. Pop. 52,357. It is the capital of the U. State, which is ab. 75 m. long and



Temples of the King at Ulwar.

has an area of ab. 3,573 sq. m. It is governed under British direction. The people are called Mewatties. Pop. 778,596.

Ulysses, or ODYSSEUS. One of the chief Greek heroes of the Trojan war; son of Laertes, husband of Penelope, and father of Telemachus; distinguished for valor and sagacity; hero of Homer's *Odyssey*, which recounts his ten years' wanderings and adventures, and his return to Ithaca.

Uma. Name given to Kali, wife of Siva.

Umatilla. Branch of the Columbia, in n.e. Oregon. Length ab. 150 m.

Umballa, or AMBALA. Town of n. India, 150 m. n.n.w. of Delhi; commercially important. Pop., 1891, 79,270.

Umbel. Flower-cluster having the pedicels all diverging from the same point, and nearly equal in length, as in Carrot and Milkweed.

Garden Angelica.

Umbellet. Partial umbel in a compound flower-cluster of that name, as in *Angelica*.

Umbelliferæ. Natural family of flowering plants of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 180 genera and ab. 1,400 species, distributed throughout the whole earth, especially through the temperate regions of the n. hemisphere; called the Parsley family.

Umber, RAW. Variety of ocher, dark brown, owing to the presence of manganese oxides; used in the manufacture of pigments. When the raw umber is heated to a redness, the brown hydrated oxide of iron is changed into the red oxide, and it is called Burnt Umber. It is redder in color.

Umberto. See HUMBERT.

Umbilical Cord. Cord-like structure, consisting chiefly of two arteries and a vein, uniting the fœtus with the placenta in the higher vertebrates.

Umbilicus. 1. Navel. 2. Aperture in the base of the *Columella* of Univalve shells. 3. Pit at the point of union of the calamus and the rhachis of the feather. 4. Passage from the intestine and ventrum of the embryo to the vitellus and allantois, or the various structures that go to make the navel string, as the vitelline duct, the allantoic stalk and the allantoic blood vessels.

Umbo. Eminence near the hinge in each valve of the shell of clams, etc., which marks the point where it began its growth. It usually points anteriorly.

Umbonate. Projecting in the center, like the boss of a shield.

Umbra. Consider a luminous body and an opaque body in its vicinity. If a cone be developed, every element of which is an external tangent to the surfaces of the two bodies, that region within the conical surface and beyond the opaque body is the umbra or complete shadow. See PENUMBRA.

Umbreit, FRIEDRICH WILHELM KARL, 1795–1860. German theologian; prof. Heidelberg 1820.

Umbrella. General body of a jelly-fish, its shape being like two open umbrellas, put one within or below the others uniting at their edges. The lower one (subumbrella) represents the ventral and peristomial surface, the upper (ex-umbrella) the dorsal surface.

Umbrella. Of high antiquity in the East, appearing on Assyrian and Persepolitan reliefs. Among the Arabs it is a mark of distinction, and generally throughout the East it is regarded as connected with royalty. Its origin has been traced by some to the tree under which sovereigns held court. In Siam, an umbrella with several rings is a prerogative of the sovereign; in Burmah, part of the royal title was Lord of the 24 Umbrellas. The first Englishman to carry an umbrella was Joseph Hanway, who died 1786; women used them a century earlier.

Umbrella-Bird (CEPHALOPTERUS ORNATUS). S. American, crow-like, fruit-eating bird, having a large crest of hair-like

Umbrella-Bird (*Cephalopterus ornatus*).

feathers that, when erected, radiate, and curve down at the ends producing an umbrella-like structure. It also has a fleshy plume-bearing process hanging from its breast.

Umbrella-Leaf. *Diphylleia cymosa.* White-flowered herb of the natural family *Berberidaceæ*, native of the s.e. U. S.

Umbrella-Tree. *Magnolia tripetala.* Small tree of the natural family *Magnoliaceæ*, bearing large white flowers, native of the s.e. U. S.

Umbria. Part of ancient Italy, on the Adriatic, e. of Etruria; finally conquered by Rome 295 B.C.

Umbrian. Italic dialect, akin to Latin, with a few inscriptions preserved from ab. 300 B.C.

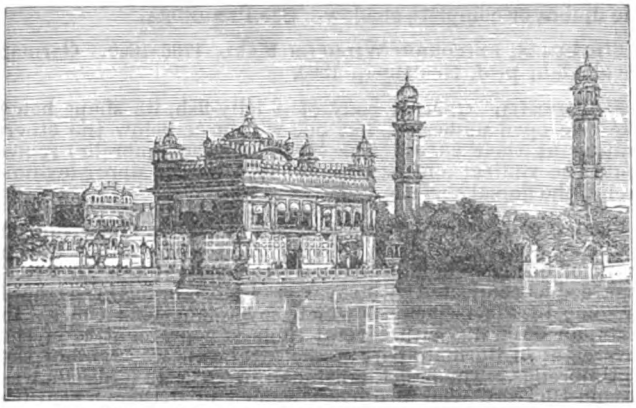
Umlaut. In German Philology, influence exerted upon a vowel in the root of a word by a vowel in the succeeding syllable. Umlaut in English is best seen in certain plurals like men, geese, feet, mice, and is here due to an i formerly present in the plural of the noun, but not in the singular. The syllable containing this i fell away, but left its influence upon the preceding vowel.

Umnak, or OUMNAK. Alaskan island, of the Aleutian group; ab. 65 m. by 10; visited 1757.

Unalashka. Aleutian island, e. of Umnak; ab. 75 m. by 20; mentioned in a celebrated line by Campbell, "The wolf's long howl from Oonalaska's shore."

Umritsur, or AMRITSAR. Commercial city of the Punjab, India, 32 m. e. of Lahore; founded by Guru Ram Das, an

apostle of the Sikhs, in 1574, round a sacred tank, from the midst of which rises the great temple of the Sikh faith. U.



Temple of Umritsur and the Lake of Immortality.

manufactures shawls; inferior, however, to those of Kashmir. Pop., 1891, 137,000, including cantonment.

Unam Sanctam. Bull of Pope Boniface VIII., claiming unbounded authority. It provoked Philip the Fair of France to the outrages which caused the death of Boniface 1303, resulting in the removal of the Papacy to Avignon, and ultimately in the Great Schism.

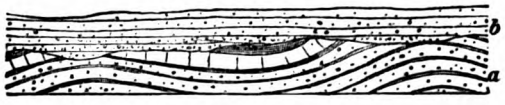
Unanue, José Hippolite, 1758–1833. Peruvian scholar and statesman.

Uncas, ab.1600–1683. Chief of the Mohegan Indians in Conn.; ally of the English in their conflicts with the Pequots and other tribes; not to be confounded with Cooper's hero.

Uncial Letters. Prevalent in MSS. ab.320–720; distinguished from the angular capitals which they superseded.

Uncinaria. Form of spicule like a needle, but bearing spines along its sides. It is derived from a hexactine, and is present in the sponge genus *Valvulina*.

Unconformable Strata. When one stratum overlies the upturned edges of another with no parallelism of dip or position. In the figure, the lower series (*a*) must first have



Unconformable Strata.

been deposited and subsequently folded and eroded, which partly removed the anticlinal arches, and afterward (*b*) was deposited.

Unconscious Cerebration. Action which so far resembles physiological functions as to be called unconscious, like the reflexes, and which yet so closely resembles mental function as to be taken for it. Carpenter used the term to express brain action reproducing past mental experience. Subliminal mental action is a better term.

Unconsciousness. Lapse of mental continuity. The possibility of absolute discontinuity of consciousness is doubtful. At the same time there are apparent breaks in an individual's mental history which demand recognition and to which the terms unconscious or subconscious may be applied. Such states are seen in sleep, fainting, hypnotic trance, etc. The main characteristic of these lapses is loss of memory on awakening for what may have occurred either objectively or subjectively during the state. The evidence for mental activity of some sort in such periods is strong: *e.g.*, dream consciousness during sleep, the complex mental activity of hysterics and hypnotics in somnambulistic conditions, etc. The term now ordinarily used to denote this state in which the ideas do not rise above the threshold into the mental focus, is subconsciousness or subliminal consciousness. See Personality.

Unction. See Extreme Unction.

Undecagon. Polygon of eleven sides.

Underbasals. See Dicyclic Crinoids.

Under-Consumption. Rapidity of consumption of certain kinds of goods insufficient to absorb the amount produced.

Undercroft. Subterranean chapel or apartment. In the cloisters of Hereford Cathedral, Eng., there is a place called Mary-croft.

Undercutting. See Holing.

Underground Railroad. Secret movement which began with Pa. Quakers, became organized 1838, and till the Civil War aided the escape of fugitive slaves. There were various routes from the Northern slave States to Canada; on each of these were stations one day's journey apart, where the runaways were fed and cared for. The reputed pres., Levi Coffin, 1798–1877, is said to have helped ab. 100 slaves annually to freedom.

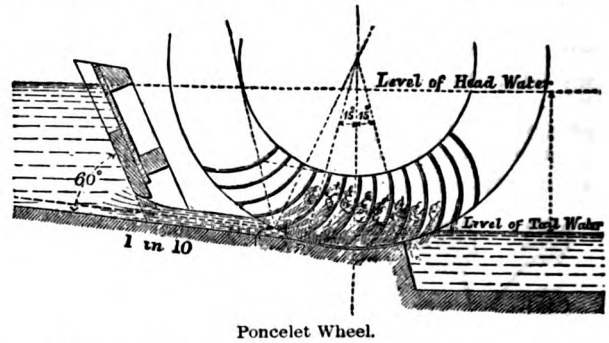
Underground Railway. See Subway and Tunnel.

Underhill, John, 1597–1672. English emigrant, in Mass. 1630–37, on Long Island from 1646. *Newes from America*, 1638.

Underlay, or Underlie. See Hade.

Underpinning. Lowest timbers in a wooden house, resting upon the cellar walls.

Undershot Wheel. Water motor, in which the water acts more by its velocity than by its weight, being laid on in a sluice or apron below the horizontal diameter of the wheel, which turns on a horizontal axis. It is a low Breast Wheel (q.v.) in its better forms, and is adapted only for very low falls with large volume of water, from which large power is sought. Efficiency of the wheels with straight blades is ab. ⅓. The



Poncelet Wheel.

Poncelet undershot or breast wheel, with curved vanes in which a reaction was manifested, gave an efficiency of 50 per cent when drowned, and 60 per cent when not. These wheels are but little used, except along the banks of streams where water can be led to them without the expense of building dams. They generally move slowly.

Understanding. Mental faculty of conception and judgment as opposed to perception on one hand, and to ratiocination and intuition, functions of reason, on the other.

Undertaker, in Economics. Person who assumes the risks and management of business, supplying or borrowing capital, employing labor, administering the buying of materials and selling of the product, and taking as his remuneration the net returns to the business enterprise.

Underwood, Francis Henry, LL.D., 1825–1894. U. S. Consul at Glasgow 1885–89, and Leith 1893–94; author of novels, Handbooks of English and American Literature, 1871–72, and Lives of Longfellow, Lowell, and Whittier, 1882–83. *Quabbin*, 1893; *Dr. Gray's Quest*, 1895.—His cousin, Lucius Marcus, b.1853, prof. Syracuse Univ. 1883–91, De Pauw Univ. 1891–93, Columbia Univ. since 1896, has pub. *Our Native Ferns*, 1881–82, and *Hepaticæ*, 1884–93.

Underwood, Joseph Rogers, 1791–1876. Ky. Judge of Appeals 1828–35; M.C. 1835–43; U. S. Senator 1847–53.

Underwriter. One who carries on the insurance business, especially marine insurance. See Insurance.

Undetermined Coefficients. Assumed quantities in the statement of known relations; their definite value becomes known in the process of reduction. The term is used as synonymous with indeterminate coefficients, but applies rather to the assumed constants in these, the values of which become known by the principles of indeterminate coefficients.

Undines. Female water-spirits of the Paracelsus system, who intermarry with human beings, and receive a soul, upon bearing a child. See Sylph.

Undulatory Theory. Propounded by Hooke 1664; developed later by Huygens, Fresnel, and Young, to explain the phenomena of light. It supposes light to consist of a wave motion set up by a luminous body in an elastic, rare, and all-

pervading medium, called the luminiferous æther. The waves are supposed to be propagated by vibrations of æther particles in directions perpendicular to the line of propagation.

Unearned Increment. That portion of the value of land which arises from the general advance of the community in wealth and population, not from any effort or sacrifice of the landowner.

Ungava Bay. Projection of Hudson's Strait into n.w. Labrador.

Unger, FRANZ. 1800–1870. Prof. of Botany at Vienna 1850. *Die exantheme der Pflanzen*, 1833; *Ueber den Einfluss des Bodens*, 1836; *Ueber den Bau und das Wachsthum des Dicotyledonenstammes*, 1840; *Genera et species plantarum fossilium* 1850; *Die fossile Flora*, 1850–67; *Anatomie und Physiologie der Pflanzen*, 1855.

Unger, JOSEPH. b.1828. Prof. of Jurisprudence at Prague 1853, and Vienna 1857; Minister of State; pres. Supreme Court 1881; writer on law.

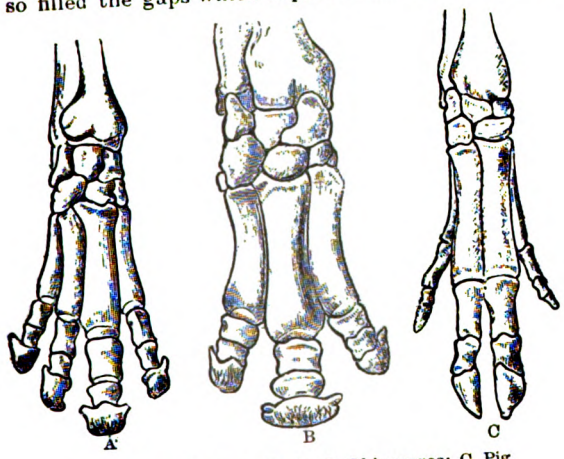
Unger, WILHELM. b.1837. Prof. Vienna; etcher. His work is distinguished by strength and freedom. Among his noted plates are: *La Ronde du Miet*, after Rembrandt; *Catharine Canaro*, after Makart; and *Portraits*, after Velasquez.

Unguents. See OINTMENTS.

Unguiculate. Furnished with an unguis or claw, as the petals or sepals of many flowers.

Ungula Spherical, or WEDGE. Solid bounded by a spherical lune and the planes of the circles forming the lune. Its edge is a diameter of the sphere.

Ungulata (HOOFED MAMMALS). In a restricted sense this group comprises only the *Diplarthra* (*Perissodactyla* and *Artiodactyla*), mammals with cotyledonary non-deciduate placenta; but resent discoveries of Tertiary vertebrates in w. U. S. have so filled the gaps which separate the various groups of



Feet of Ungulata: A, Tapir; B, Rhinoceros; C, Pig.

Placentalia that certain authors include the Subungulates of the section *Zonaria* (including the *Taxeopoda*, *Proboscidæ*, and *Amblypoda*) and the Proungulates of the section *Discoidea* (including the *Bunotheria* and *Rodentia*), all of the division *Deciduata*. It appears probable that the character of the placenta cannot be used strictly for purposes of classification.

Unguligrade. Having the toes furnished with hoofs, as in the *Artiodactyla* and *Perissodactyla*.

Uniates. Greeks, Maronites, and other Eastern Christians, subject to Rome, but retaining their peculiar rites, discipline, and liturgical languages.

Unicapsular. Dry compound fruit.

Unicellular. Consisting of but one cell, as does the entire body in most of the *Protozoa* and *Protophyta*.

Unicorn. Mythical one-horned horse, believed in by the ancients. The word thus tr. in O. T. probably means the wild ox or buffalo. See MONODONTIDÆ and RHINOCEROTIDÆ.

Unicorn-Plant. *Martynia proboscidea*. Odorous, pubescent, coarse herb of the natural order *Pedalineæ*, bearing fleshy, long-beaked pods; cultivated as a vegetable; native of the s.w. U. S.

Unifoliolate. Compound leaf composed of a single leaflet, as in the barberry; distinguished from simple leaves by the presence of an articulation at the base of the leaflet.

Uniformitarianism. Doctrine in Geology, of which Lyell was the strongest exponent, maintaining that the past changes which the earth has undergone have been produced by causes still in action. The doctrine has been pushed by some of its more recent advocates to extreme conclusions, against which a reaction has set in.

Uniformity, ACTS OF. Enforcing the use of the English Prayer-book 1549, and its revised forms 1552, 1558, and 1662. The last caused the ejection of some 2,000 nonconforming clergy, and was revoked 1689.

Unigenitus. Bull of Pope Clement XI., Sept. 8, 1713, virtually condemning Jansenism through 101 statements of Quesnel. It caused great ecclesiastical commotions in France.

Unilabiate. Having one lip, as some gamopetalous corollas; or apparently one-lipped by the splitting of the tube of the corolla down one side, as in the *Ligulatæ*.

Unilateral. One-sided, or with parts arranged along one side.

Unilocular. In Biology, one-chambered ovary or other hollow organ.

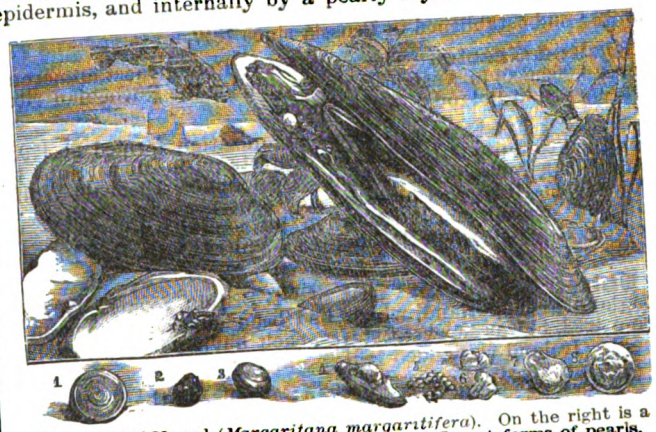
Unimak. Alaskan island, largest of the Aleutian group and nearest mainland; ab. 50 m. by 20.

Union. See UNITED KINGDOM.

Union Christian College. Coeducational institution, founded 1859 at Merom, Ind., by a denomination called Christians.

Union College. See UNION UNIVERSITY.

Unionidæ (NAJADES, FRESHWATER MUSSELS). Lamellibranchs, with short siphons produced by the free apposition of the edges of the mantle, for a short distance. The valves of the shell are equal, but unsymmetrical; they are united by two adductor muscles, and covered externally by a smooth epidermis, and internally by a pearly layer. The foot has a



Stream Pearl-Mussel (*Margaritana margaritifera*). On the right is a half-open example with mantle pearl. 1–8, different forms of pearls.

sharp edge; the gills are united posteriorly. The outer pair of gills also function as a brood pouch for the developing young. Here belong *Anodon* and *Unio*, the freshwater clams. Some species of this family produce pearls of considerable value. A collection from Wis. was exhibited at the World's Columbian Exposition, Chicago, 1893. Many were discovered in Arkansas 1897. See PEARLS.

Union Jack. National banner of the United Kingdom of Great Britain and Ireland. The first one was proclaimed 1606, three years after the union of the English and Scottish crowns. It was a combination of the crosses of St. George and St. Andrew. On the union with Ireland the cross of St. Patrick was introduced. It consists of a blue ground, with the upright cross of St. George, in red, edged with white; and the saltire or diagonal cross of St. Patrick, red, edged on one side by the cross of St. Andrew, white.

Union Theological Seminary. In New York; Presbyterian, but open to all and free from ecclesiastical control; founded 1836; incorporated 1839; removed from University Place to 700 Park Avenue, Sept. 1884. It has 13 instructors, 134 students, over 1,800 graduates, and a library of 71,576 vols.

Union University. At Schenectady, N. Y.; chartered 1795 as Union Coll. Its present title was assumed 1873, when the Albany Medical Coll. and Law School, with the Dudley Observatory, were united under one board. In 1881 the Coll. of Pharmacy was organized. Pres. E. Nott directed the institution most successfully 1804–66. It was the first non-secta-

rian coll. in the U. S., and the first to place the modern languages in the curriculum. A school of civil engineering was organized 1845. It has (1897) 30 instructors, 221 students, and a library of 31,000 vols. The Greek letter fraternities originated here in 1825, Kappa Alpha being the first.

Unipetalous. Lacking all but one petal, as *Amorpha*.

Uniserial. Arranged in one row, or consisting of a single whorl.

Unisexual. See DICLINOUS.

Unit. Quantity taken together as a basis of comparison and combination. The abstract unit, one, is the base to which all finite quantity is referred.

Unitarians. Christians who deny the divinity of Christ; in the U. S., originally seceders from Trinitarian Congregationalism 1812 and later. They have ab. 437 congregations and 68,250 members, especially in New England. The movement was earlier but less extensive in England. It was anticipated at the Reformatian by Socinus.

Unitas Fratrum. See MORAVIANS.

United Armenians. Those subject to Rome; chiefly in the Turkish empire. Previous to the massacres there were ab. 100,000, with a patriarch, 6 abps., and 16 bishops.

United Brethren in Christ. Sect distinct from the Moravians, organized in Pa. 1800 by P. W. Otterbein (1726–1813); resembling the Methodists, but with quadrennial bishops. They have ab. 2,140 ministers, 4,200 congregations, and 210,000 communing members.

United Christians of St. Thomas. In s. India; mostly subject to Rome since 1599: these number ab. 235,000. See CHRISTIANS OF ST. THOMAS.

United Copts. R.C. Egyptians, numbering ab.12,000, and in Abyssinia possibly more.

United Evangelical Church. Lutheran and Reformed, united and established in Prussia since 1817.

United Greeks. Those subject to Rome; most numerous (over 4,000,000) in Austria-Hungary, under the Ruthenian rite. Others are in Poland and elsewhere.

United Irishmen. Secret organization formed ab.1793, designed to unite Catholics and Protestants in an attempt to establish a republic in Ireland. Its founder, Theobald Wolfe Tone (1763–1798), was arrested and sentenced to death by a military commission 1798, when he committed suicide. It ceased to exist when Ireland was united with Gt. Britain 1801.

United Kingdom. That of Gt. Britain, formed 1707 by England and Scotland, which had been under one sovereign from 1603, but as separate states, each having its own parliament. Ireland was added 1801.

United Nestorians. Roman Catholics of the Syrian rite dating from 1553; also called Chaldean Christians.

United Oriental Rites. See UNIATES.

United Original Seceders. Scottish body, formed 1820. See PRESBYTERIANS.

United Presbyterian Church OF N. AMERICA. Union, formed 1858, of Associate and Reformed synods. It has ab. 900 ministers and 120,000 members. The kindred body in Scotland, formed 1847 by union of the Secession and Relief synods, has ab. 580 ministers and 192,000 members. See PRESBYTERIANS.

United Provinces. Holland, Zealand, Utrecht, and other Dutch States, associated 1579 against Spanish tyranny.

United Secession Church. Religious body which was formed by the union of the Associate and General Associate Synods of Scotland in 1820 and united to the United Presbyterian Ch. in 1847.

United Society of Believers. See SHAKERS.

United States. Republic of N. America, by far the largest, most populous and powerful on the w. continent. Its area is 3,026,500 sq. m. (excluding Alaska, which has 530,000). It extends from long. 67° to 124° W. and from lat. 24° 30′ to 49° N. The w. part consists of a broad elevated tableland, extending from the n. to the s. boundary and from long. 105° W. nearly to the Pacific: this plateau is capped by many mountain ranges, trending nearly n. and s., parallel to its general direction, the highest being upon its e. and w. borders. The elevation of the plateau ranges from 10,000 ft. in central Col. down to 4,000 ft. near the n. and s. boundaries, while the mountain ranges rise from 4,000 ft. to 8,000 ft. higher, with many summits exceeding 14,000 ft. The e. slope of this plateau consists of the great plains, a long, gentle incline. A second system of elevation is found in the e. part of the country, known as the Appalachian system. It trends in a direction nearly n.e. and s.w., extending from Me. to Ala. In length, breadth, and altitude it is much inferior to the w. system. Between these two systems of elevations is a great depression or plain, the s. and greater part of which is drained by the Mississippi and its tributaries, while the n. part is occupied by the system of the Great Lakes. E. of the Appalachians is a plain extending with a gentle incline to the Atlantic coast, known as the Atlantic plain. The average elevation of the country is 2,600 ft.

The streams of the Atlantic plain are comparatively short, and few are navigable above the head of tide. On the n. boundary is a series of great lakes, drained by the St. Lawrence. The Mississippi is one of the great rivers of the world. With its numerous large branches, it drains an area of ab. 1,250,000 sq. m., and has a navigable length of ab. 10,000 m. It drains not only the great valley but the w. slopes of the Appalachians and the e. slopes of the w. mountain system. The principal streams of the Pacific from this region are the Columbia, Sacramento, and Colorado. Much of the interior of the plateau is drained to neither ocean.

The n. part of the Atlantic coast is rugged and broken. From N. Y. s. to and around the Gulf, the coast is low and sandy, with reefs extending along the shore, protecting marshy areas or bays behind them. The whole Atlantic coast abounds in deep bays and excellent harbors. The Pacific coast is bluff and rocky, with deep water immediately off shore, and very few harbors.

The temperature has a wide range, with the latitude and the altitude above sea level. Along the Gulf coast the mean annual temperature ranges from 70° to 75°, while in the n. parts

Appropriation of N. America by Europeans in 17th Century.

it is less than 40°, as also in the high plateau region of Col., Wy., and Mont. The range between summer and winter is, in general, great as compared with that of more humid countries, and becomes still more accented in the w. plateau region. The rainfall, too, varies through wide limits. It is heaviest upon the immediate Gulf coast, where it averages ab. 60 in. annually, and diminishes gradually n., and more rapidly w., being in the region about the Great Lakes from 30 to 40, on the w. plateaus 10 or 15, and in some regions not more than 4 or 5 in. Upon the n.w. coast there is a heavy rainfall, brought there by the warm air currents of the Pacific, which is deposited on the narrow strip of land w. of the Cascades. The e. and s. parts of the U. S. are, or were originally, covered with forests, which in the more densely settled parts have been largely cut away. Bordering this timbered area is a prairie region, forming a belt of separation between the forest area and the treeless plains, and including parts of Tex., I. T., Kan., Mo., Ill., Ind., Mich., Wis., Ia., Minn., and N. and S. Dak. From this region w. to the base of the mountains extend the Great Plains, which are almost entirely devoid of trees. Within the mountain region, the valleys, plains, and plateaus are generally treeless. The mountains are as a rule covered with forests, and upon the Cascades, and throughout the region w. of them to the Pacific, the country is densely covered with valuable timber. The lumber industry is very large. See FORESTRY and TIMBER.

The mineral resources are very great. Anthracite coal is extensively mined in Pa., and bituminous coal in a majority of the States and Territories. The distribution of iron ore is equally wide, but it is mined on a large scale mainly on the upper peninsula of Mich., and in Ala. and Pa. The precious metals are mined mainly in the w. States and Territories, copper principally on the upper peninsula of Mich. and in the w.

Lead is mined in the w. in connection with silver, in s. Mo., s.e. Kan., and in s.w. Wis. Petroleum is found mainly in w. Pa. and N. Y. Natural gas has recently come into very extensive use and is drawn from the earth mainly in w. Pa. and Ohio. Salt is obtained mainly from springs on the lower peninsula of Mich. and in w. N. Y. The salt mines of N. Y. are also large producers.

Agriculture is still the leading industry, although in many of the more densely settled e. States it has largely given place to manufactures. The value of farms, farming implements and machinery in 1890 was $13,773,500,116. The number of

farms in that year was 4,564,641, and their average size 137 acres, showing a continuous decrease in size. The area of improved land was 357,616,755 acres. The estimated value of agricultural products in 1889 was $2,460,107,454. Of these the principal product is wheat, which is raised mainly in the n. States of the Mississippi Valley. Cotton is raised almost exclusively in the s. States. The production of Indian corn is widespread. Tobacco is cultivated mainly in the States in middle latitude. Manufactures are very extensive and varied. They form the principal industry in the n.e. States, while in the s. and w. they are mainly confined to the larger cities. The fisheries are extensive, the product being valued in 1890 at $45,312,818. The railroad mileage in 1897 was 178,549.33, being greater than that of all Europe.

The population in 1890 was 62,831,900, of which 9,249,547 were of foreign birth, including 107,475 Chinese and 7,638,360 of the colored race. The average density of population was 20.7 to a sq. m., ranging from 276.4 in R. I., the most densely settled State, to absolutely uninhabited regions. The urban population is rapidly increasing, and in 1890 comprised 18,284,385, or more than 29 per cent of the entire number. Foreign immigration has been great since 1847. It was in 1897 230,832, mainly Irish and German. The total immigration from 1820 to 1897 inclusive was 17,775,524, not including that from Mexico and British America since 1885.

Each State has a public school system, upon which there was expended in 1894–95, in the entire country, the sum of $178,215,556. The government is a republic, the executive consisting of a President, Vice-president and Cabinet, the members of which form the heads of executive departments; namely, State, Treasury, War, Atty.-gen., Postmaster-gen., Navy, Interior, and Agriculture. The legislative department is represented by a Congress, consisting of two houses: Senate, 90 members, two from each State; and House of Representatives, 357 members, one for 173,901 inhabitants, and 3 delegates, one from each Territory, except Alaska and Indian Territory.

The receipts of the government are derived mainly from customs duties, and internal revenue levied upon tobacco and spirits. The total receipts in 1897 were $347,721,905, and expenditures for all purposes, including interest and payments on the principal of the public debt, were $365,774,159. Nov. 1, 1897, the net debt was $1,808,777,643.40. The number of post offices was, June 30, 1897, 70,022. The regular army comprised in 1897 2,179 officers and 25,353 men. The militia comprised 113,460 officers and men. The navy comprised 90 vessels, including 19 ironclads, with 726 officers, 8,250 men, and 2,177 marines. The naval militia comprised 3,871 officers and men.

There are 45 States, 5 Territories (including Alaska and Indian Territory), and one federal district. The governments of the States are in all essential respects similar to that of the U. S. The executive officers of the Territories are appointed by the President, and the legislatures elected by the people. The States and Territories are divided into counties. In the s. and most of the w. States and in the Territories the county is the smallest subdivision which has political power. In New England the county has little political power, the primary unit of governmental organization being a subdivision of the county known as a town or city. In the n. States of the Mississippi valley and in N. Y., N. J. and Pa. the counties are divided into townships or towns, and the political power is divided between them and the counties.

The roots of the history of the U. S. are in the colonial settlements. Among the earliest were, St. Augustine, Fla., by Spaniards in 1565; Jamestown, Va., by English in 1607; New Amsterdam by the Dutch in 1613; Plymouth, Mass., by the Pilgrims in 1620; Mass. Bay, 1630. All the thirteen original colonies were in existence by 1681, New Amsterdam having been wrested from the Dutch 1664–74, and named New York in honor of James II.'s brother, the Duke of York, who became proprietor of the colony. The first attempt at confederation was made by some of the New England settlements 1643, for mutual defense against French, Dutch, and Indians. Representative governments had forced their way into all the colonies, whether charter, proprietary, or royal. As the colonies were regarded as mere instruments for the enrichment of England, collisions were almost sure to arise, and the colonial feeling of loyalty was much shaken by the renewal in 1761 of regulations of trade, which had become practically obsolete, and which worked hardship and injustice to the colonies, such as the Navigation Acts, Writs of Assistance, Stamp Act, Billeting Act, and finally the Port Act, by which the port of Boston was declared closed. "The news of these acts of Parliament crystallized every element of union in the colonies", a union which had already been made possible by the experience, mutual confidence and esteem gained through the French and Indian War. The schism once formed widened and deepened. The feeling of resistance made itself felt in the organization of a Colonial Congress, the first national body in American history, the main result of which was the approval of Mass.'s resistance to the execution of the offensive Parliamentary acts, and the promise of support in case those acts were executed by force. This was the prelude to war, which broke out 1775 at Lexington and Concord in resistance to Gen. Gage's attempt to seize colonial munitions. From this dates the real political existence of the nation. At the assembling of the 2d Colonial Congress, revolution was a fact, and Congress proceeded to raise and equip an army. The idea of independence, against which the colonies had hitherto protested, was embodied in the Declaration of Independence 1776. The war was carried on with varying fortunes, mainly in the north until 1779, and after that mainly in the south until the surrender of Cornwallis, Oct. 17, 1781, which won from England a treaty of peace and the recognition of independence.

The era of struggle for a national government was introduced under the Articles of Confederation, adopted by the colonies during the progress of the war. A convention, called to frame a new Constitution, met in Phila. May 1787 and adjourned Sept., after having adopted the present Constitution

and provided for its execution after its ratification by nine of the colonies. N. H. was the ninth to ratify, whereupon Congress at once named the days for the choice of electors, the vote for President and Vice-President, and for their inauguration. The unanimous choice fell on Washington for President; John Adams, having received the next highest number of votes, was elected Vice-President.

The two terms of Washington and the one of Adams following were chiefly taken up with the organization of the new government and the development of internal affairs. Jefferson's two terms included the acquisition of the Louisiana ter-

ritory, more than doubling the area of the U. S.: Madison had to deal with the first serious foreign complication since the Revolution, the WAR OF 1812 (q.v.), which was concluded by the Peace of Ghent 1815.

The most important subsequent events before the Civil War were connected with the annexation of Texas. This was favored by the South, for the reason that it would thereby gain the balance of power. Mexico declared that the annexation of Texas would be occasion of war, and, as soon as Texas was recognized as a State 1845, began hostilities on the U. S. side of the Rio Grande. The war was concluded 1847 by the entrance of the Americans into the city of Mexico. By the treaty of peace the U. S. gained possession of New Mexico and upper California.

By far the most serious internal difficulties of the Republic were caused by the fact of slavery and by the theory, which was in part the outgrowth of this fact, that the government was a league of States which might be dissolved at will by any of the States within the league. This interpretation of the Constitution, of which Calhoun was chief representative, easily lent itself to the slave interest, and the menace of schism and secession was a constant element in the history of the quarter century preceding the outbreak of the Civil War, which came at last in the secession of the Southern States immediately after the election of Lincoln by the newly formed Republican party. War was practically begun by the bombardment of Fort Sumter April 14, 1861; the first blood was shed in the streets of Baltimore April 19, when a mob attempted to stop Mass. troops on their way to Washington.

At the beginning of the war the extermination of slavery was not in the purpose of the North, and Pres. Lincoln had

Great Seal of the United States.

expressly declared his intention not to suppress it in the States where it existed. But the issue was vaster than men dreamed; pent-up forces found a way for themselves; it was actually the "irrepressible conflict," and the war which began with the purpose of suppressing rebellion ended with the emancipation of the slaves. The war was concluded by the surrender of Gen. Lee's army at Appomattox, April 9, 1865, which was almost immediately followed by the assassination of Pres. Lincoln, April 15.

The period since the war has been a period of reconstruction and recuperation. The seceding States were admitted again to the Union on condition of their acceptance of the 14th Amendment to the Constitution, which provided for the suffrage of the emancipated slaves and the recognition of the war debts of the loyal States. It was not until 1871 that all the States were again readmitted and represented in Congress.

The social reconstruction necessarily walks at a slower pace than the political reconstruction. The customs and prejudices of a hundred years are not to be overcome by an act of Congress or a resolution of the will. The new social status will establish itself with the lapse of time. The new era of the U. S. is industrial and economic. The recent national elections have been influenced chiefly by questions of legislative and tariff reform and of finance; the interests of labor are rapidly coming to be the controlling factors both in theoretical and practical politics. In this new era into which the U. S. are entering they "must meet and solve a new problem—the reconciliation of democracy with the modern conditions of production." See CONGRESS (CONTINENTAL), EMANCIPATION PROCLAMATION, U. S. NAVY, and ORGANIZATION OF U. S. ARMY; also the executive departments under their respective titles.

United States Bank. See BANK.

U. S. Military Academy. At West Point, N. Y.; founded 1802. Each Congressional district, Territory, and the District of Columbia, is entitled to one cadet: the whole number authorized is 370; the Pres. appoints 10 cadets at large. There were in 1896 8 professors, 55 commissioned officers, a chaplain, a sword-master, a teacher of music, and 332 cadets. The library contained 39,141 vols. Besides mathematical, scientific, and military courses, instruction is given in English, French and Spanish, history and ethics, international law, and U. S. Constitution. Discipline is more strict here than in the army. Cadets are required to take an oath of allegiance and to bind themselves to serve the U. S. for 8 years from admission. The reservation contains ab. 2,300 acres, the jurisdiction of which has been ceded by New York to the U. S. government. During the Revolutionary War, West Point was one of the most important posts for the defense of the Hudson, owing to the narrowness of the river and the bold character of the heights of the plateau of West Point and of Constitution Island opposite. Washington occupied Moore's house, the owner of the grant, in 1779 from July 25 to Nov. 28 as his headquarters.

U. S. Naval Academy. At Annapolis Md.; was founded 1845 by G. Bancroft, Sec. Navy. During 1861–65 instruction was given at Newport, R. I. One cadet is allowed for each member of the House, one for the District of Columbia, and ten for the country at large: the latter are appointed by the Pres. A four years' course of study is supplemented by two years' service at sea, after which come the final examinations. The instructors are mainly naval officers. See NAVAL ACADEMY.

U. S. Navy. This dates from Oct. 13, 1775, when two cruisers, of 10 and 14 guns respectively, were authorized by Congress. By the end of the year 15 more vessels, of 20 to 30 guns, were added. The present department was established in 1798. In 1897 this comprised, with vessels under construction, 11 battleships, 2 armored cruisers, 13 protected cruisers, 6 double-turret monitors, 13 single-turret monitors, 1 ram, 3 cruisers, 9 gunboats, 6 composite gunboats, 22 torpedo boats, 1 dynamite cruiser, 1 submarine torpedo boat, 1 dispatch boat, 1 training ship, 6 old iron vessels, 10 old wooden vessels, 6 sailing vessels and 12 tugs. There are 726 officers, 8,250 men and 2,177 marines enrolled in the navy. See NAVY DEPARTMENT.

U. S. Treasury. See TREASURY, U. S.

United Synod of the Presbyterian Church. Name taken by the Southern members in 1858 on the withdrawal of the New School Presbyterians in the U. S.

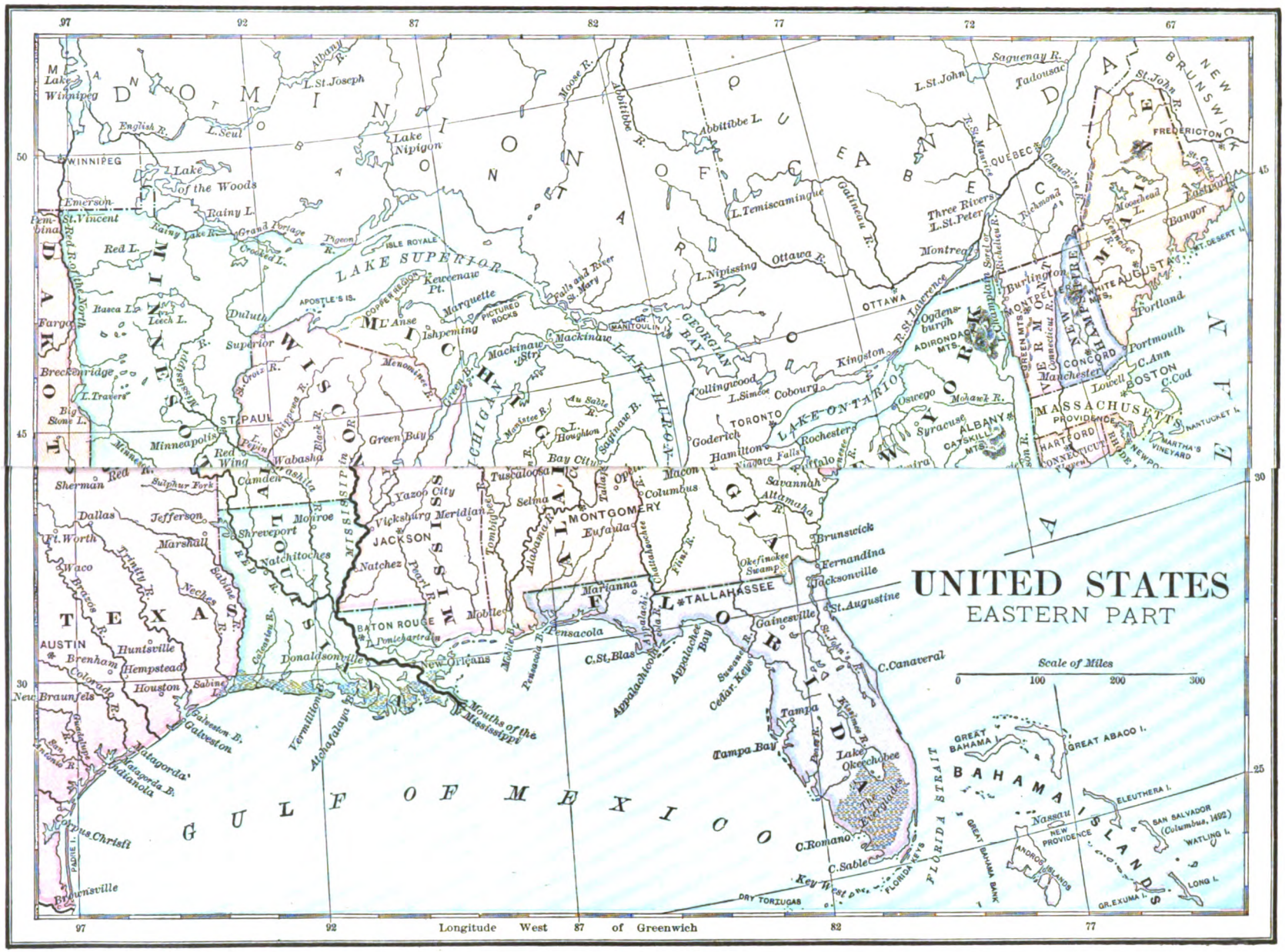
United Syrians. Syrian Catholics, who comprise the Syrian rite in the Eastern rite of the R.C. Ch.

Unities, DRAMATIC. Of action, time, and place; insisted on by some on the alleged authority of Aristotle; long observed, especially in France, but now, except the first, less regarded.

Units. A unit of measurement is a concrete quantity of the same kind as the quantity to be measured, arbitrarily chosen, in terms of which the result of the measurement may be expressed. There are as many kinds of units as of physical quantities to be measured. The full expression of the result of a measurement consists of two parts, a symbol denoting the concrete unit employed, and a number showing how many times the unit is contained in the quantity measured. For example, if a quantity is expressed by q [Q], q is the number of times that [Q] the unit is contained in the quantity. The selection of [Q] is entirely arbitrary, but for the more ready comparison of results it has been agreed among scientific men to use the same units, and where these have been fixed by law they are called standards. The British yard and the meter are examples. If a certain number of fundamental units be arbitrarily chosen as a basis, and all other units be derived from these, the system thus formed is called an absolute system of units. If three fundamental units be chosen, viz., those of length, mass, and time, most of the others necessary for physical measurements can be derived from these. The fundamental units adopted 1861 by the British Association, viz., the centimeter, gramme, and second, form the basis of the most important absolute system; from the initial letters of the units, this is known as the C.G.S. system. The system based upon the foot, pound, and second is called the F.P.S. system, and this the British government uses in magnetic surveying.

The U. S. standards are the yard, equal to the English imperial yard; the troy pound of 5,760 grs., from which the avoirdupois pound of 7,000 grs. is derived; the gallon of 231 cu. in. capacity. In France the unit of length is the meter; of volume, the litre, 1,000 cu. cm.; of mass the kilogramme, 1,000 gm. The meter is equal to 39.37 in. The unit of time is the solar second.

In the centimeter-gramme-second system the unit of area is the square centimeter; of volume, cubic centimeter; of velocity, a body moving through 1 cm. in 1 sec.; of acceleration, that which produces in 1 sec. an increase of 1 cm. a sec.; of force, the dyne, which acting on 1 gm. produces a velocity of 1 cm. per sec.; of work and energy, the erg, the work and energy of 1 dyne through 1 cm.; of power, that of 1 erg per sec.


UNITED STATES
EASTERN PART
Scale of Miles
0
100
200
300
Longitude West of Greenwich
97
92
87
82
77
72
67
50
45
30
25
DOMINION OF CANADA
NEW BRUNSWICK
MAINE
NEW HAMPSHIRE
VERMONT
MASSACHUSETTS
NEW YORK
MICHIGAN
WISCONSIN
MINNESOTA
DAKOTA
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
GULF OF MEXICO
BAHAMA ISLANDS
FLORIDA STRAIT
WINNIPEG
QUEBEC
OTTAWA
Montreal
Three Rivers
L.St.Peter
L.Temiscamingue
Ottawa R.
L.Nipissing
Abbitibe L.
Abbitibe R.
Moose R.
Saguenay R.
L.St.John
Tadousac
St.John R.
FREDERICTON
Bangor
Moosehead L.
Portland
Portsmouth
C.Ann
C.Cod
BOSTON
Lowell
Manchester
CONCORD
WHITE MTS.
AUGUSTA
MT.DESERT I.
Burlington
MONTPELIER
GREEN MTS.
Ogdensburgh
ADIRONDACK MTS.
Kingston
Oswego
Mohawk R.
Syracuse
ALBANY
CATSKILL MTS.
Rochester
Niagara Falls
Buffalo
TORONTO
Hamilton
Goderich
Collingwood
L.Simcoe
Cobourg
PROVIDENCE
HARTFORD
CONNECTICUT
NANTUCKET I.
MARTHA'S VINEYARD
NEWPORT
Savannah
Altamaha R.
Macon
Columbus
Brunswick
Fernandina
Jacksonville
St.Augustine
Gainesville
Okefinokee Swamp
TALLAHASSEE
Marianna
Apalachicola
Appalachee Bay
C.St.Blas
Pensacola
Mobile
Tuscaloosa
Selma
MONTGOMERY
Eufaula
Bay City
Saginaw B.
Au Sable R.
Mackinaw
Mackinaw Str.
MANITOULIN
GEORGIAN BAY
Marquette
PICTURED ROCKS
Falls and River St.Mary
Keweenaw Pt.
COPPER HARBOR
APOSTLE'S IS.
ISLE ROYALE
Duluth
Superior
Ishpeming
L'Anse
Menominee R.
Green Bay
Green B.
Manistee R.
L.Houghton
Minneapolis
ST.PAUL
Red Wing
Wabasha
Winnipeg
Lake of the Woods
Rainy L.
Rainy Lake R.
Grand Portage
Pigeon R.
Emerson
St.Vincent
Pembina
Red L.
Red R.of the North
Fargo
Breckenridge
L.Travers
Big Stone L.
Basca L.
Leech L.
Mississippi R.
Lake Nipigon
L.Seul
English R.
Albany R.
L.St.Joseph
Sherman
Red R.
Sulphur Fork
Camden
Dallas
Jefferson
Ft.Worth
Marshall
Shreveport
Monroe
Waco
Trinity R.
Brazos R.
Natchitoches
Neches R.
Sabine R.
Red R.
Natchez
Vicksburg
Meridian
JACKSON
Yazoo City
Pearl R.
Tombigbee R.
Tallapoosa R.
Chattahoochee R.
Flint R.
Alabama R.
Mobile
Pensacola B.
Mobile B.
Mouths of the Mississippi
New Orleans
BATON ROUGE
L.Pontchartrain
Donaldsonville
Galveston
Galveston B.
Sabine L.
Houston
Hempstead
Brenham
AUSTIN
Huntsville
Colorado R.
New Braunfels
Guadalupe R.
San Antonio R.
Matagorda
Matagorda B.
Indianola
Corpus Christi
Brownsville
PADRE I.
Colorado R.
Vermillion R.
Atchafalaya R.
Suwanee R.
Cedar Keys
Tampa
Tampa Bay
Peace R.
Kissimee R.
Lake Okeechobee
The Everglades
C.Canaveral
C.Romano
C.Sable
Key West
DRY TORTUGAS
FLORIDA KEYS
GREAT BAHAMA I.
GREAT ABACO I.
Nassau
NEW PROVIDENCE
ANDROS ISLANDS
GREAT BAHAMA BANK
ELEUTHERA I.
SAN SALVADOR (Columbus, 1492)
WATLING I.
LONG I.
GR.EXUMA I.

The electrical units adopted by the International Electrical Congress at Chicago in 1893 are as follows: Ohm, unit of resistance, that of a column of mercury 0° C., 14.4521 gm., 106.3 cm. long. Ampere, unit of current, that which precipitates 0.001118 gm. silver per sec. from a solution of silver nitrate in water. Volt, unit of electromotive force, that which applied to a conductor of 1 ohm resistance produces a current of 1 ampere. Coulomb, unit of quantity, that transferred by 1 ampere in 1 sec. Farad, unit of capacity, that of a condenser charged to a potential of 1 volt by 1 coulomb. Joule, unit of work, energy by an ampere in an ohm in 1 sec. Watt, unit of power, work at rate of 1 joule per sec. Henry, unit of induction, that in a circuit when electromotive force is 1 volt, while inducing current varies 1 ampere per sec. See THERMOMETRY.

Unity. Measure of the ratio of equality between two magnitudes.

Univalent Elements. Those having a VALENCE (q.v.) of I.

Univalve. Shell all in one piece, as that of the snail.

Univalvular. Having but one valve, in consequence of dehiscence taking place on one side only, as in the follicle.

Universal Expositions. See EXPOSITIONS, INTERNATIONAL.

Universal Happiness. That of all beings capable of pleasure and pain, whose feelings are affected by human conduct, thus including the lower sentient beings as well as man.

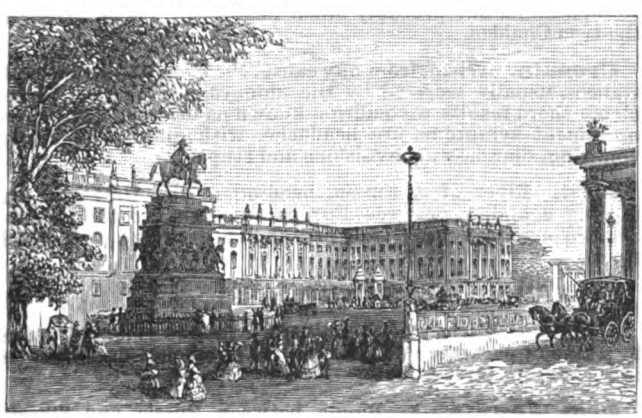
Universal Joint. In Mechanics, an arrangement which allows one piece of a machine to be moved freely in all directions in relation to another. The ball and socket joint is an example. See FLEXIBLE JOINT.

Universalism. Doctrine that all rational creatures will eventually be reconciled to God and enter into eternal life; preached in America by John Murray from 1770. The first congregation was formed in Mass. 1779; organization was effected 1803. There are now over 1,000 parishes with ab. 46,000 members. The government is Congregational.

Universal Language. One intended to serve as a medium of communication throughout the world for commercial purposes or for educational men. Numerous schemes have been presented, but all have been found wanting. See PIDGIN-ENGLISH and VOLAPUK.

Universe. The world; collective name of heaven and earth, and all that belongs to them; the whole system of created things.

Universities of Europe. The dates given for these are partly of the charters, and partly of the schools from which they developed. Paris 1109, Salamanca 1209, Bologna 1116, Padua 1222, Naples 1224, Rome 1303, Perugia 1306, Florence 1320, Pavia 1361, Ferrara 1391, Oxford 1133, Cambridge 1257, St. Andrews 1411, Glasgow 1453, Edinburgh 1582, Dublin 1592,



University of Berlin.

Prague 1348, Cracow 1364, Vienna 1365, Heidelberg 1385, Cologne 1388, Leipzig 1409, Basel 1460, Tübingen 1477, Göttingen 1737, Berlin 1809, Bonn 1818, Upsala 1477, Copenhagen 1475, Leyden 1575, Dorpat 1622, Moscow 1755, St. Petersburg 1819. See COLLEGES.

University College. In London; established 1825, chartered 1826, opened 1828; then known as London University. In 1836 it received a charter as University College, and as such still exists. At the same date London University was chartered, which gives no instruction, and confers degrees upon candidates from other colleges upon examination.

University Extension. Educational movement under the supervision of some institution of higher learning or a group of such institutions. Instruction is given by lectures at stated periods, part of the time being given up to the answering of questions. James Stuart in 1867 delivered such a course before some women's clubs in England, and in 1873 Cambridge Univ. took up the work. J. N. Larned introduced them into the U. S. in 1887, but the movement did not succeed, until the Univ. of Pa. sent George Henderson to England to study the work. The work has spread to all parts of the country, the Univ. of Chicago supporting a special department for this work.

University of the South. At Sewanee, Tenn.; founded 1858. The Civil War swept away its buildings and endowment, except 10,000 acres of land. The college department was opened 1870, the theological 1873, medical 1892, and law school 1893. It is directed by representatives of the P. E. Ch., has 38 instructors, ab. 300 students, and 36,000 vols. in its library.

University of the State of New York. Incorporated institution, including, in 1895, 466 institutions, 381 of which were academies and high schools, and 85 professional and degree-conferring institutions, besides the State Museum and State Library. It was incorporated 1784, and its power increased 1889 and 1892. It is governed by a board of regents elected by the Legislature. It confers degrees.

University Settlements. Homes in the poorer quarters of a city, where cultivated people may go and live among the destitute and try to make a common life for both. Edward Denison in 1867 and Arnold Toynbee in 1875 called attention to the worth of scholars in the elevation of the poor. Cambridge Univ. entered upon the task, but the plan has passed beyond university impulse. Lectures and studies, and every ingenious device which helps to build up society and personal character, enters into it. From England it passed to Scotland, and in 1887 appeared in New York as a Neighborhood Guild. By 1896 it had appeared in all the principal cities of the U. S. The Coll. Settlement in New York, the Hull House in Chicago, Denison and Andover houses in Boston, and the Phila. Coll. Settlement, are the best examples in the U. S.

Unknown Quantities. In Elementary Algebra, those which are sought as the result of given conditions.

Unkpapas. One of the seven tribes of the SIOUX (q.v.) confederacy.

Unlawful Assembly. Meeting of three or more persons with a riotous purpose. If they fall short of their purpose, the offense is a rout.

Unleavened Bread. See PASSOVER.

Unproductive Labor. That which does not tend to the increase either of necessaries, of capital, or of accumulated wealth.

Unsaturated Compounds. Those capable of uniting with elements, radicals, or other compounds: *e.g.*, ammonia, NH_3, will unite with hydrochloric acid to form ammonium chloride, NH_4Cl; ethylene, C_2H_4, will unite with bromine to form ethylene dibromide, $C_2H_4Br_2$.

Unselfishness. Disposition of one who can forego his own gratification when that of another comes in competition with it.

Unstable Equilibrium. Condition such that, if an extraneous force slightly displace the body, it does not tend to return to its original position on the removal of the force. See EQUILIBRIUM.

Unsymmetrical. Having parts differing in number, or indivisible into like parts by an axis.

Unterwalden. One of the four "Forest Cantons" of Switzerland; s.w. of Lake Lucerne. It is divided into two parts, Upper and Lower. Capital of the Nidwald, Stanz; of the Obwald, Sarnen. Area 295 sq. m., pop. ab. 27,600, chiefly R. C. and German.

Unwin, WILLIAM CAWTHORNE, F.R.S., b.1838. English engineer. *Iron Bridges and Roofs*, 1869; *Machine Design*, 1877; *Testing of Materials*, 1888.

Unyoro. Native African state, s.e. of Lake Albert Nyanza and n. of Uganda. Pop. ab. 1,500,000.

Unzaga, LUIS DE, ab.1720–ab.1790. Gov. of La. 1769, of Caracas 1776, and of Cuba 1783–85.

Upanishads. Latest portions of the Vedantic literature, dating from ab.500 B.C. and later; foundation of modern pantheistic Hinduism, and earliest theological speculation of India.

Upas-Tree. *Antiaris toxicaria.* Tall tree of the natural family *Urticaceæ*, native of Java, where it grows to a height of 60 to 80 ft. before branching. Its juice is poisonous; the

Upas-Tree.

slightest wound by an arrow tipped with it is fatal. The old stories of the desolation amid which it grows are apocryphal. No evil effects followed its introduction into hothouses 1844.

Upcast. Shaft in a mine through which the vitiated air rises to the surface; opposite of downcast.

Upchurch, JOHN JORDEN, 1822–1887. Founder (in Pa.) of the order of United Workmen 1868.

Upcott, WILLIAM, 1779–1845. English antiquarian.

Upernivik. Town in Greenland, on an islet off the w. coast in 72° 48′ N. lat. It is the northernmost Danish set-

General View of Upernivik.

tlement in Greenland. Its mean yearly temperature for eleven years was 17.4° F. It varies from 6° F. in January to 41° F. in July.

Upfold, GEORGE, 1796–1872. P.E. Bishop of Ind. 1849.

Upham, CHARLES WENTWORTH, 1802–1875. M.C. from Mass. 1853–55; author of several biographies. *The Logos*, 1828; *Witchcraft*, 1831–67; *Prophecy*, 1835.

Upham, THOMAS COGSWELL, D.D., LL.D., 1799–1872. Prof. Bowdoin Coll. 1825–67. *Mental Philosophy*, 1827; *The Will*, 1834; *Life of Faith*, 1846; *Life of Mme. Guyon*, 1847; *Divine Union*, 1851; *Christ in the Soul* (hymns), 1872.—Of his brothers, NATHANIEL GOOKIN, LL.D., 1801–1879, was Judge N. H. Supreme Court 1833–43; FRANCIS WILLIAM, LL.D., 1817–1895, wrote *Church and Science*, 1860, and other religious books.

Upington, SIR THOMAS, b.1844 in Ireland. Atty.-gen. of Cape Colony 1878–81 and 1886–90; Premier 1884–86; Judge Supreme Court 1892.

Upjohn, RICHARD, 1802–1878. Anglo-American architect; designer of Trinity Ch., New York, and of many other notable buildings.—His son, RICHARD MICHELL, b.1828, planned the capitol at Hartford, Conn., a cathedral at Fond du Lac, Wis., and many churches.

Upolu. One of the Samoan Islands, lat. 14° S., long. 172½° W.; pop. 25,000, two-thirds Christians.

Upper Klamath Lake. In s. Oregon, on Klamath River. Area 163 sq. m.

Upper Peru. Colonial name for Bolivia.

Upsala. Ancient Swedish town, 44 m. n.n.e. of Stockholm; noted for its cathedral, erected 1289–1435, and partly burned 1702. The univ., founded 1477 and newly housed 1877, has ab. 2,000 students and a library of 250,000 vols., and 11,000 MSS., among which is the famous *Codex Argenteus* of Ulfilas's translation of the Gospels into Gothic. Here dwelt till 1056 the ancient kings of Sweden, of two dynasties, supposed descendants of Woden; and here was Woden's great temple, the last seat of paganism, burned ab.1060. Pop., 1891, 21,511.

Upset Rods. Rods having the ends enlarged so that the effective section may not be diminished by cutting screw threads upon them.

Upshur, ABEL PARKER, 1790–1844. Va. Judge 1826; Sec. Navy 1841; Sec. of State 1843; killed on the *Princeton* by the bursting of a gun.—His nephew, JOHN HENRY, U.S.N., b.1823, served on the Atlantic coast 1861–65, became Captain 1872, and Rear-admiral 1884.

Upson, ANSEL JUDD, D.D., LL.D., b.1823. Prof. Hamilton Coll. 1853–70, and Auburn Theol. Sem. 1880–87; Chancellor of Univ. State of N. Y. 1893.

Upthrow. Amount of dislocation in a faulted bed of ore, or of coal measured in a vertical direction upward.

Upton, EMORY, U.S.A., 1839–1881. Brig.-gen. U. S. Vols. 1864–66; distinguished in Va. campaigns; commandant at West Point 1870–75. *Infantry Tactics*, 1867; *Armies of Asia and Europe*, 1878.

Upton, FRANCIS HENRY, 1814–1876. Lawyer in New York. *Law of Trade Marks*, 1860; *Commerce during War*, 1863.

Upton, GEORGE PUTNAM, b. 1834. Musical critic of Chicago *Tribune* from 1862 to 1881. *Woman in Music*, 1880–86; *Standard Operas*, 1885; *Oratorios*, 1886; *Cantatas*, 1887; *Symphonies*, 1888.

Upton, WINSLOW, b.1853. Prof. Brown Univ. 1884; writer on astronomy.

Ur. Birthplace of Abraham; formerly placed in Upper Mesopotamia, but probably much nearer the Persian Gulf, in the true Chaldea.

Uræmia. When, from any cause, the excrementitious substances, usually secreted by the kidneys, are retained in the blood, there results a condition known as uræmia. The most prominent symptoms are headache, with dimness of vision, vomiting, diarrhœa, convulsions and stupor.

Ural. River of e. Russia, heading in the Ural Mts. and flowing e. and s., between Europe and Asia, to the Caspian Sea through a delta. Length 930 m., drainage area 90,889 sq. m.

Ural-Altaic. See SCYTHIAN.

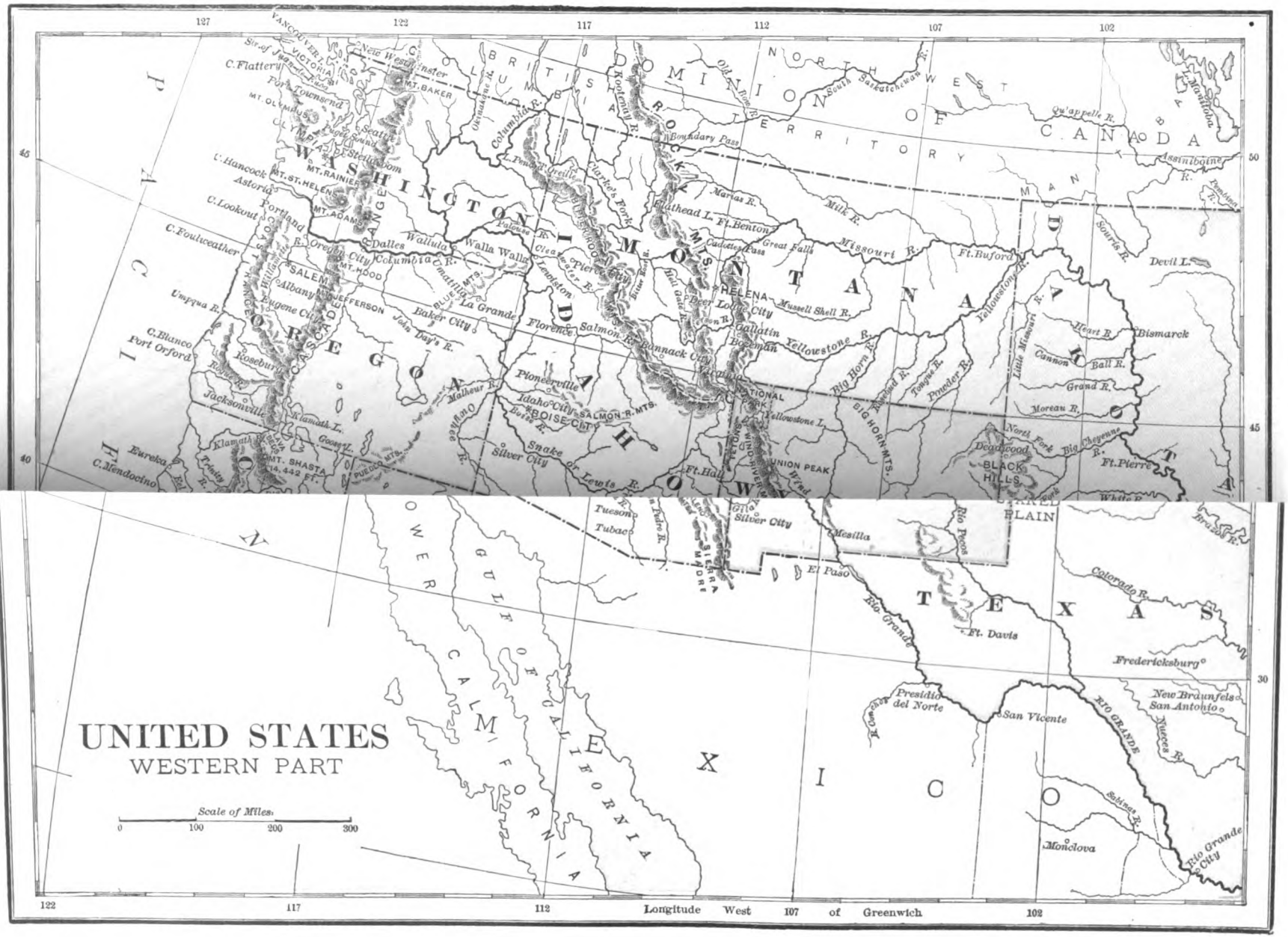
Uralite. Variety of the mineral AMPHIBOLE (q.v.), formed by a kind of paramorphic alteration of pyroxene; first observed in rocks from the Ural Mts.

Ural Mountains. Range between Russia and Siberia. It extends from lat. 52° to the Arctic Sea, lat. 69°, and separates the waters of the Volga and the Petchora on the w. from those of the Obi on the e. Its height exceeds 5,000 ft. in but few places, and it contains numerous easy passes. It is composed of Archæan and volcanic rocks, and contains mines of gold, platinum, copper, and iron.

Uralorthite. Variety of the mineral ALLANITE (q.v.), found in the Ural Mts.

Uranates. Salts of uranic acid.

Urania. 1. She was regarded as the Muse of Astronomy,


UNITED STATES
WESTERN PART
Scale of Miles
0
100
200
300
Longitude West of Greenwich
127
122
117
112
107
102
50
45
40
30
DOMINION OF CANADA
BRITISH COLUMBIA
NORTH WEST TERRITORY
MANITOBA
WASHINGTON
OREGON
IDAHO
MONTANA
DAKOTA
WYOMING
NEBRASKA
COLORADO
UTAH
NEVADA
CALIFORNIA
ARIZONA
NEW MEXICO
TEXAS
LOWER CALIFORNIA
GULF OF CALIFORNIA
Vancouver I.
Victoria
New Westminster
Strait of Juan de Fuca
C. Flattery
Port Townsend
Mt. Olympus
Port Angeles
Seattle
Port Gamble
Steilacoom
C. Hancock
Mt. Rainier
Mt. St. Helens
Astoria
Mt. Adams
C. Lookout
Portland
C. Foulweather
Dalles
Oregon City
Salem
Mt. Hood
Albany
Eugene City
Mt. Jefferson
Umpqua R.
C. Blanco
Port Orford
Roseburg
Jacksonville
Klamath L.
Goose L.
Eureka
C. Mendocino
Mt. Shasta
14,442 Ft.
Pueblo Mts.
Blue Mts.
Walla Walla
Wallula
Lewiston
La Grande
Baker City
John Day's R.
Malheur R.
Owyhee R.
Boise City
Idaho City
Pioneerville
Salmon R. Mts.
Silver City
Snake or Lewis R.
Florence
Salmon R.
Bannack City
Virginia City
Helena
Fort Benton
Great Falls
Cadotte's Pass
Boundary Pass
Flathead L.
Marias R.
Milk R.
Missouri R.
Fort Buford
Musselshell R.
Yellowstone R.
Bozeman
Gallatin
Big Horn R.
Big Horn Mts.
Tongue R.
Powder R.
Yellowstone Nat. Park
Yellowstone L.
Union Peak
Wind River Mts.
Fort Hall
Big Sioux R.
Little Missouri R.
Heart R.
Bismarck
Cannon Ball R.
Grand R.
Moreau R.
Devil L.
Souris R.
Assiniboine R.
Qu'appelle R.
Saskatchewan R.
Deadwood
Black Hills
North Fort
Big Cheyenne R.
Fort Pierre
White R.
Platte R.
Great Salt L.
Tucson
Tubac
Silver City
Mesilla
El Paso
Rio Grande
Rio Pecos
Fort Davis
Presidio del Norte
San Vicente
Fredericksburg
New Braunfels
San Antonio
Nueces R.
Sabinas R.
Monclova
Rio Grande City
Colorado R.
Brazos R.
Sierra Madre

and is usually represented with a staff and a globe in her hands. 2. Surname of Aphrodite. In Mythology, one of the

Urania.

nine MUSES (q.v.), represented as the daughter of Zeus and Mnemosyne.

Uranine. $C_{20}H_{12}Na_2O_5$. Sodium salt of fluorescein. It is a yellow solution employed in volumetric analysis, as its fluorescence is destroyed by an acid solution.

Uraninite. Mineral consisting chiefly of two uranium oxides, UO_3 and UO_2, with smaller quantities of lead and some of the rarer chemical elements. In some varieties nitrogen has also been detected. In a massive form, as it occurs in Bohemia, from which most of the uranium of commerce is obtained, it is known as pitchblende.

Uranite. TORBERNITE (q.v.), or uranium mica.

Uranium. U. At. wt. 239.6, sp. gr. 18.7, sp. ht. .0276, valence II, IV, VI. One of the rarer chemical elements; discovered by Klaproth 1789; found in small quantities in several minerals, and as an essential element in uraninite. The metal is prepared from the tetrachloride by treating it with sodium. It has the color of nickel, oxidizes when heated, and is soluble in the ordinary acids. Its compounds are used in coloring glass fluorescent greenish-yellow and painting on porcelain.

Uranium Bromides. Tribromide. UBr_3. Dark-red, volatile, hygroscopic needles, made by treating the tetrabromide with hydrogen.—Tetrabromide. UBr_4. Brown to black fusible leaflets, made by fusing the oxide, U_3O_8, with carbon in presence of bromine vapors.

Uranium Chlorides. Uranium Tetrachloride, Uranous Chloride. UCl_4. Dark-green octahedra, prepared by passing chlorine over heated uranium.—Uranium Trichloride. UCl_3. Dark-brown powder, obtained by passing hydrogen over the tetrachloride.—Uranium Pentachloride. UCl_5. Found in two forms: in black crystals, and a brown powder; made by passing chlorine over the tetrachloride.

Uranium Oxides. Green Oxide. U_3O_8. Found in pitchblende; made by heating the di- or trioxide; dark-green powder of satiny luster.—Uranic Trioxide, UO_3, or Uranyl Oxide, $(UO_2)O$. Formed by heating uranic nitrate in a tube to 250° C.; brownish-yellow powder.—Uranium Dioxide. UO_2. Brown or copper-red powder, formed by heating the trioxide or uranic oxalate in a stream of hydrogen. It takes fire when heated, and is soluble in strong acids.—Uranium Tetroxide. UO_4. Colorless, crystalline powder, formed by adding a solution of uranyl nitrate to a mixture of hydrogen dioxide and sulphuric acid, and allowing it to stand.

Uranium Sulphate. $U(SO_4)_2+4H_2O$. Deep-green crystals, made by treating the oxide, U_3O_8, with sulphuric acid.

Uranium Sulphides. Monosulphide. US. Black amorphous powder, made by the reduction of the sesquisulphide.—Sesquisulphide. U_2S_3. Grayish-black substance, made by treating the heated tribromide with hydrogen sulphide.—Disulphide. US_2. Dark gray powder, obtained by the action of hydrogen sulphide upon the heated tetrachloride.

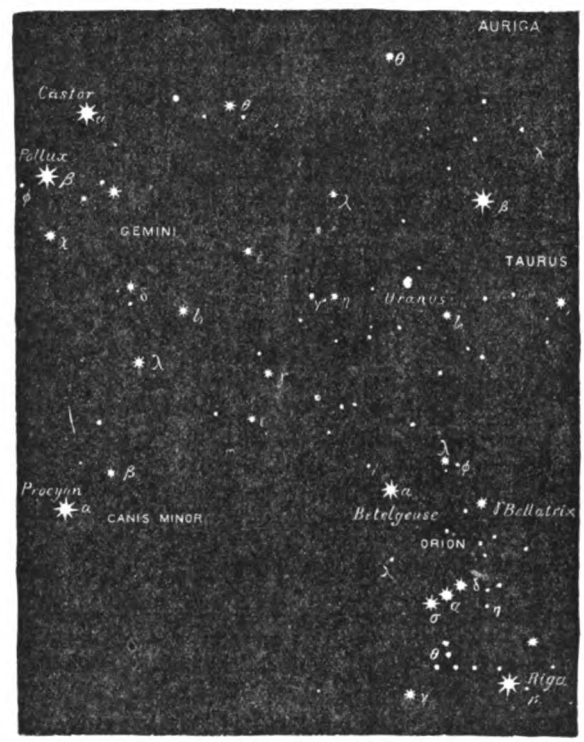
Uranium Tetrafluoride. UFl_4. Green insoluble powder, made by treating the oxide, U_3O_8, with hydrofluoric acid.

Uranium Yellow. See SODIUM DIURANATE.

Uranoliths. See METEORITES.

Uranometria. Understood by astronomers to mean a catalogue of naked-eye stars, as the U. Nova of Argelander, and the U. Argentina of Gould.

Uranus. Except Neptune, furthest planet from the Sun, 1,781,900,000 m.; diameter 31,900 m.; volume 65 times that of the earth, mass 14.7 that of the earth: density 1.22 that of water; time of revolution about sun 84.02 years; time of revolution about axis not known: discovered March 13, 1781, by Herschel, who supposed it to be a comet. Belts have been seen on the surface similar to those of Jupiter, but they are of the faintest possible character. After the computation of



Approximate position of Uranus at time of its discovery.

the orbit it was found that the planet had been previously observed no less than 19 times, none of the former observers suspecting it to be other than a fixed star. There are 4 satellites, as follows:

Names.	Discovery.	Distance from Uranus.	Period.				Diameter.
		miles.	d.	h.	m.	s.	mi le.
Ariel	Lassell 1851	120,000	2	12	29	21.1	500?
Umbriel	" "	167,000	4	3	27	37.2	700?
Titania	W. Herschel 1787	273,000	8	16	56	29.5	1,000?
Oberon	" "	365,000	13	11	7	6.4	800?

The inclination of the orbits to the plane of the ecliptic is 75° 18′: the motion is retrograde.

Uranus. Son and husband of Gæa (Earth); father of Oceanus, Themis, Cronos, the Cyclopes, etc. He hated his children and shut them up in Tartarus, for which he was dethroned by Cronos at Gæa's instigation.

Uranyl Compounds. Those derived from acids by the replacement of the hydrogen by the bivalent group uranyl, UO_2; *e.g.*, uranyl sulphate, UO_2SO_4.

Urao. Variety of TRONA (q.v.) found in Venezuela.

Urari. *Strychnos toxifera.* Small tree of the natural family *Loganiaceæ*, native of n. S. America. Its sap is poisonous, and is used by the Indians in tipping arrows. See CURARA.

Urashimo Taro. The Rip Van Winkle in Japanese folklore. The story furnishes subjects for art treatment.

Urates. Salts of uric acid.

Urban I. Bp. of Rome 222–230; supposed martyr.—II. EUDES DE LAGNY, monk of Cluny; Bp. of Ostia; pope 1088–99. He expelled the Emperor Henry IV. from Rome, and raised the first crusade, and was opposed by an antipope, Clement III.—III. UBERTO CRIVELLI, Abp. of Milan, pope 1185–87. He quarreled with Barbarossa.—IV. JACQUES PANTALÉON, Bp. of Verdun and Patriarch of Jerusalem; pope 1261–64; at war with Manfred of Sicily.—V. GUILLAUME DE GRIMOARD, Abbot at Marseilles; pope 1362–70; at Avignon till 1367, then at Rome till near his end.—VI. BARTOLOMMEO PRIGNANI, Abp. of Bari; pope 1378–89; opposed by a French antipope, Clement VII., 1378–94.—VII. J. B. CASTAGNA, pope Sept. 15–27, 1590.—VIII. MAFFEO BARBERINI, 1568–1644; cardinal 1605; pope 1623. He

Monument over the grave of Pope Urban VIII., by Bernini, in St. Peter's at Rome.

wrote hymns, revised the bull *In Cœna Domini*, canonized Loyola and Xavier, and supported France against Spain and the Empire. Under him Galileo was condemned.

Urbanists. Followers of the Order of St. Clara, who adhered to the rules as modified by Urban IV. See CLARA, ST.

Urbi et Orbi. Phrase signifying univeral application; used in papal bulls.

Urbino. Ancient town of e. Italy, birthplace of Raphael; governed by dukes 1474–1631; part of the papal states 1631–1860; now secluded and decayed, as is its univ., founded 1564. It has a fine palace and other notable old buildings. Pop. ab. 5,100, commune ab. 17,250.

Urceolate. Cup-shaped, with a narrowed top; urn-shaped.

Urdaneta, RAFAEL, 1789–1845. Venezuelan general, active in the war of liberation; Sec. of War; acting Pres. of Colombia 1830–31.—His cousin, FRANCISCO, 1791–1861, was a Colombian general.

Ure, ANDREW, M.D., F.R.S. 1778–1857. Scottish chemist, in London from 1830. *Dict. Chemistry*, 1821; *Geology*, 1829; *Manufactures*, 1835; *Cotton Manufacture*, 1836; *Dict. of Arts, Manufactures, and Mines*, 1837.

Urea. $O{:}C{:}(NH_2)_2$. Solid base, contained in the urine of mammals, birds, and in other animal fluids; prisms, mpt. 132° C.; separated from urine as a nitrate, or prepared by heating ammonium cyanate; by the latter process, discovered by Wöhler 1828, it was the first organic compound made artificially.

Uredineæ. Subclass of *Fungi*, including an immense number of minute species, mainly parasitic on flowering plants and ferns, and often extremely destructive; also called RUST and SMUT (q.v.).

Uredospores. Spores produced in the Uredo state of *Fungi*, of the subclass *Uredineæ*. It is this phase of the life-history of these parasites which is so destructive to their hosts.

Ureides. Combinations into which dibasic acids and urea enter with the splitting out of water. Thus from oxalic acid and urea we have parabanic acid,

$$\begin{matrix} CO.OH \\ CO.OH \end{matrix} + O{:}C{:}\begin{matrix} NH_2 \\ NH_2 \end{matrix} = O{:}C\begin{matrix} .NH{:}CO \\ .NH{:}CO \end{matrix} + 2H_2O$$

Ureter. When the urine is secreted by the kidneys it is gathered into a cavity of that organ known as the pelvis of the kidney, whence it is conveyed to the bladder by a duct, known as the ureter. It is from 16 to 18 in. long, is placed along the back of the abdomen and enters the bladder at its base.

Urethane. $O{:}C{:}NH_2.OC_2H_5$. Ethyl carbamate: colorless plates, mpt. 50° C., formed by the action of ammonia on ethyl chlorocarbonate; soporific, used in pharmacy. See CARBAMIC ACID.

Urethra. Canal through which the urine is voided from the bladder.

Urga. Capital of n. Mongolia; on the Tola; noted for its Buddhist monasteries. Pop. ab. 30,000.

Uri. Rural Swiss canton, s. of Lake Lucerne. Area 416 sq. m.; pop. ab. 17,250, mostly R. C. and German.

Uriah. Officer and victim of King David. His wrongs were denounced by the prophet Nathan, II. Sam. xii. 1–12.

Uric Acid. $C_5H_4N_4O_3$. Weak dibasic acid of complicated structure, occurring in urine and other animal fluids; white powder, soluble with difficulty in water. Upon oxidation it furnishes urea, alloxan and other products. It occurs in urinary calculi; ab. 5 grams are daily excreted in human urine.

Magnified view of Uric Acid in different forms:

The dumb-bell shaped forms seen in upper part of the figure were formerly supposed to consist of oxalate of lime. It has recently been shown that they are a form of uric acid crystals.

Uriel. In Jewish (not Biblical) Angelology, one of the seven archangels.

Urim. See THUMMIM.

Urinary Calculi. See CALCULI and STONE.

Urinary Organs. Those organs concerned in the secretion and excretion of urine; more especially the kidneys with their ducts, the ureters, the bladder and its canal, the urethra.

Urinatores. Group of Natatores, with short or rudimentary wings, and feet placed far back and webbed. They are all strong swimmers, and mostly confined to cold seas. Here belong the Auks (*Alcidæ*), Guillemots, Divers, and Grebes. The last group has its toes more or less separately webbed. The second and third have completely webbed feet with rudimentary hallux in the former, and free hallux in the latter.

Urine. Fluid secreted by the kidneys, conveyed to the bladder by the ureters, and voided by the urethra. The normal urine of man is a clear yellowish fluid with a specific gravity approximating 1.020, having an acid reaction. The more important solids held in solution are urea and uric acid (nitrogenous crystalline bodies), sodium chloride, sodium, calcium and magnesium phosphates. Urine may become abnormal by the presence of unusual components, as albumen in Bright's disease, or sugar in diabetes; or by an excess of a normal constituent, as uric acid in a gouty diathesis. Urine contains a large part of the nitrogen of animal voidings, and is therefore valuable as a fertilizer, but it so readily undergoes fermentation and decomposition that great care is necessary to prevent the escape of the nitrogen into the atmosphere.

Urine, RETENTION OF. See RETENTION OF URINE.

Urinogenital. See UROGENITAL.

Urinometer. Form of hydrometer for determination of the density of urine.

Urmia. See URUMIAH.

Urn. In general any vase; specially, the vessel in which the ashes of the dead are preserved. See CREMATION.

Urochorda. Tunicates; so called because some of the forms, and the young generally, possess a notochord in the tail. See CHORDATA.

Urocyst. Urinary bladder.

Urodæum. Middle portion of the cloaca, into which the urinogenital organs open.

Urodela (SAUROBATRACHIA, SOZURA, ICHTHYOMORPHA, CAUDATA). Elongated, naked-skinned *Amphibia*, having a persistent tail and two pairs of short limbs. External gills are present, at least in the early stages. Two suborders are included, ICHTHYOIDEA and SALAMANDRINA (q.v.).

Urogenital Sinus. Sort of cloaca into which the urinary and genital ducts open, the intestinal opening being shut off by itself. Better Urinogenital Sinus.

Uropeltidæ. See COLUBRIFORMIA.

Uropods (SWIMMERETS). Hindmost pair of abdominal appendages in *Crustacea*, particularly in *Macroura*.

Uropygial Gland. Oil gland in the pygostyle of birds.

Urostyle. Long central bone which forms the hinder portion of the vertebral column in frogs and toads. It is formed from the two anterior caudal vertebræ.

Urpethite. Natural hydrocarbon compound, brownish in color and very soft, allied to ozokerite.

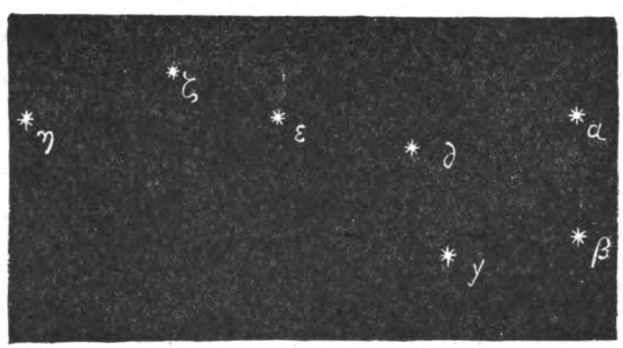
Urquhart, DAVID, 1805–1877. Scottish writer on Russia and Asia. *Spirit of the East*, 1838; *Progress of Russia*, 1853.

Urquhart, SIR THOMAS, 1605–1660. Scottish royalist, translator of Rabelais 1653–61. *Epigrams*, 1461; *Works*, 1834.

Urquiza, JUSTO JOSÉ DE, 1800–1870. Argentine general and despot, ally of Rosas till 1851, then his foe and conqueror; Pres. 1853–59; slain by malcontents.

Urrutia, IGNACIO DE, 1730–1798. Cuban historian 1795.

Ursa Major AND **Minor.** Two constellations, known to the ancients; so named by Ptolemy. The former includes the Dipper, the latter the Pole Star. In Ursa Major, the seven



Ursa Major.

principal stars are arranged as shown in the figure, and are known as the Plow or Charles's Wain in England. The two brightest stars, α and β, are termed the pointers, because they always point to the Pole Star.

Ursidæ. Family of *Arctoidea*, including the BEARS (q.v.), characterized among *Carnivora* by possessing short tails, elongated muzzle, long but non-retractile claws fitted for digging, circular pupil, short ears, smooth tongue, and teeth partly vegetarian in character, the carnassial teeth having tuberculated crowns. None exist in Australia and Africa. S. America has but one species, the Spectacled Bear of Peru.

Ursinus, ZACHARIAS, 1534–1583. Prof. Heidelberg 1561–68; framer, with Olevianus, of the Heidelberg Catechism. He wrote against the Lutheran *Formula Concordiæ*.

Ursinus College. At Collegeville, Pa.; incorporated 1869; controlled by Reformed Ch. It maintains collegiate, preparatory, and theological departments. Teaching staff, 23: students, 24 theological, 80 collegiate, total 213.

Ursua, or **Orsua,** PEDRO DE, ab.1510–1561. Spanish soldier and explorer in S. America; murdered on the Amazon.

Ursula, ST. Legendary daughter of a British chief, slain by Huns near Cologne, with her "11,000 virgins," while returning from a pilgrimage to Rome, in the 3d, 4th, or 5th century.

Ursulines. Order of nuns, founded 1537 in Italy, confirmed 1544. They are engaged in teaching and charitable work, and have spread widely.

Urticaceæ. Natural order of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Apetalæ*, comprising 110 genera and ab.1,560 species, widely distributed throughout the temperate and warm regions of the globe; called the Nettle family.

Urticaria. See HIVES.

Urticating Cells. See NETTLE CELLS.

Uruguay. Branch of the Rio de la Plata, heading in s. Brazil, and flowing s.w. and s., forming the boundary between Brazil and U. on the e., and the Argentine Republic on the w. Length 1,020 m.

Uruguay. Republic of S. America, s. of Brazil and e. of Argentina; area 72,170 sq. m. Near the coast the surface is low, level and open: it becomes more undulating inland, gradually rising to forest-clad hills in the interior. The raising of horses and cattle constitute the principal industry. The capital is Montevideo. It was first explored 1512 by Solis, who found it occupied by the Charruas and other tribes. Unsuccessful attempts to subdue the natives were made through a series of years. The Spaniards were finally established ab. 1729. After a long struggle between Brazil and the revolutionists in Buenos Ayres for supremacy in U., it was declared independent 1828; but for years its history was filled with invasions from without and financial and political disasters from within. Pop., 1892, 728,447.

Urumiah, or URMIA. Town of n.w. Persia, 75 m. s.w. of Tabriz; seat of important missions. Pop. ab. 35,000. The lake of the same name is 12 m. from the town; altitude 4,100 ft., area 1,600 sq. m., greatest depth 46 ft. It has no outlet. The water contains saline matter 8.5 times that in ocean water.

Urumtsi. City of Zungaria, w. China, n. of Tian-Shan Mts.; important commercially. Pop. ab. 40,000.

Urus. Species of ox, now extinct, which lived in the forests of Europe, and was described by Cæsar. It is said to have survived to the 16th century.

Usage. Business practice which has become habitual. If known to both parties to a contract, it may modify its written terms. It must be proved by the party who depends on its existence.

Usance of Wealth. Benefits derived by the owner; more than interest, which is only the money income arising from the use of that part of wealth known as capital.

Usbeks, or UZBEGS. Principal tribe of Turkestan, extending w. to the Caspian Sea. It consists of a union of heterogeneous Turkish and Mongolian elements, cowardly, though

Usbek.

passionate and revengeful, noted robbers, and fanatical Mohammedans. Some are agriculturists, some nomads. They number ab. 2,000,000, half of whom are in Bokhara.

Use and Occupation. Action brought for the use of real property, when no rent has been agreed upon.

Usener, HERMANN, b.1834. Prof. Bonn 1866; prolific writer on ancient Greek topics. *Pelagia*, 1879; *Epicurea*, 1887.

Usertessen. Names of three kings of the 12th Egyptian dynasty.

Uses. Equitable interests in land, the legal title to which is in another. They originated in the English Statute of Uses under Henry VIII., and are regulated to a great extent by statute in America.

Usk. Beautiful river of s. Wales, celebrated for its salmon. It rises in the Black Mts. and flows 57 m. s.e. into the Bristol Channel.

Ussher, or **Usher,** JAMES, D.D., 1581–1656. Prof. Dublin 1607; Bp. of Meath 1621; Abp. of Armagh 1625; in England from 1640; acting Bp. of Carlisle; preacher at Lincoln's Inn 1647–55; respected by all parties for learning and moderation. The chronology of his *Annales V. et N. Test.*, 1650–54, tr. 1658, was long accepted.

Ustilagineæ. Order of *Fungi*, of the subclass *Zygomycetes*, parasitic on flowering plants, causing the diseases of grasses commonly known as Rust and Smut.

Ust Urt. Desert plateau from 600 to 1,000 ft. high between the Caspian and Sea of Aral. Area ab. 92,000 sq. m.

Usufruct. Civil law term for the right of using and taking the fruits of any property of another, without, however, consuming or injuring it.

Usumacinta. River of Central America, formed by several branches, rising in the e. part of Guatemala, flowing n.w. 400 m. and joining the Tobasco or Grijalva.

Usury. Originally, interest, payment for the use of money; in modern usage, excessive interest, higher than a certain maximum rate prescribed by law. Such laws are mostly retained in the U. S., though repealed 1854 in England. The Jews were forbidden to receive interest, except from foreigners.

Utah. One of the w. States, between Col. and Nev.; area 84,970 sq. m. It is divided into two parts by the Wasatch Mts. and by a line of high plateaus. Extending s.e. of this is a plateau region descending to the Col. and Green rivers; w. of it is the Great Basin, a region which has no outlet to either ocean, and consists of narrow mountain ranges, separated by broad desert valleys. The industries consist of agriculture, which is carried on universally by the aid of irrigation, with some stock-raising and mining. The capital is Salt Lake City, near the shore of Great Salt Lake. U. was a portion of the territory ceded by Mexico to the U. S. 1848. It was organized as a territory 1850, and then included the area covered by Nev., Col., and Wyo., which were subsequently set off and have become States. U. is the center of the Mormon Church; its settlement in the region of Salt Lake was begun under the leadership of Brigham Young 1847 (see MORMONS and NAUVOO). U. was admitted Jan. 1896 as the 45th State. Pop., 1890, 207,905; estimated, 1895, 254,743.

Utah, UNIVERSITY OF. At Salt Lake City; head of the school system; successor of the Univ. of Deseret, incorporated 1850; rechartered 1892 with the present name. It has 12 professors, 11 instructors, 65 collegiate students, 320 in the normal courses, and 520 in all.

Utah Lake. In n. central Utah, at w. base of the Wasatch Mts. It is drained into Great Salt Lake by Jordan River. Area 150 sq. m.

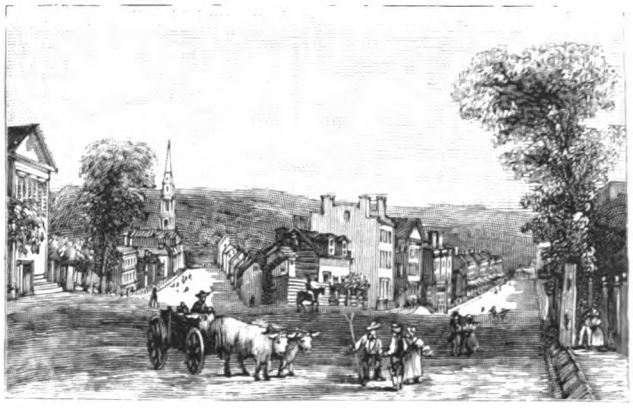
Utah State Agricultural College. At Logan, founded 1888. It has 22 instructors, 129 students in college courses, and a total of 497.

Uterine Diseases. Uterus is liable to disease depending upon a pathological change in any of the tissues which enter into its composition; *e.g.*, there may be a catarrh of its lining mucous membrane; upon a malposition, either in whole or in part of the organ itself, as retroversion or retroflexion; or upon an abnormal manifestation of its function, as metrorrhagia. Because of the large distribution of nerve tissue to the organ and its surrounding parts, uterine diseases often assume a seriousness far beyond the extent of the local lesion.

Uterus. In the *Mammalia*, the organ that receives and cares for the fecundated ovum, after conception, during the period of embryonic life, and expels it by the process of parturition at the expiration of the period of gestation. In woman the non-gravid uterus is pear shaped, ab. 3 in. in length, 2 in. broad at its upper and broader portion, 1 in. in thickness, and weighing from 1 oz. to 1½ oz. During pregnancy it increases enormously in size, weighing from 1½ lb. to 3 lbs.

Utes. Utahs, including the Pah-utes, Gosh-utes, Pi-utes, etc.; ab. 15,000 Indians of Shoshone stock, inhabiting Utah, Colorado, New Mexico, and Arizona; now on various reservations. They stand lowest among N. American aborigines, feeding on whatever they find, as roots, seeds, grasshoppers, and reptiles.

Utica. Capital of Oneida co., N. Y.: on s. bank of the Mohawk; site of Fort Schuyler; chartered 1798 and 1832; noted



Utica in 1830.

for its benevolent institutions and cotton mills. It is ab. 500 ft. above sea level, and has 13 public parks and squares. A State asylum for the insane is here. Pop., 1890, 44,007.

Utica. Phœnician city of n. Africa, founded ab. 1100 B.C., 20 m. n.w. of Carthage; capital of a Roman colony from 146 B.C.; held for the republicans by Cato, who killed himself here 46 B.C.; destroyed by Arabs ab. 750. Its ruins are extensive.

Utica Shale. Thick bed overlying the Trenton Limestone in the Eastern States. See ORDOVICIAN.

Utilitarianism. Form of ethics and politics which judges the rightfulness or wrongfulness of all institutions and actions by their utility to society; opposed to idealism; advocated by Cumberland, Hume, Bentham, and Mill.

Utility. Quality of answering to some felt human want. It is to be carefully distinguished from value, which supposes a process of exchange as well as one of use.—In Ethics, either that which will be of ultimate advantage, as Hume uses the term, or that which gives immediate happiness, as Bentham uses it.

Utopia. 1. Latin political romance pub. by Sir Thomas More 1516; tr. 1551. 2. Any imaginary community with institutions supposed to be perfect.

Utraquists. See CALIXTINES.

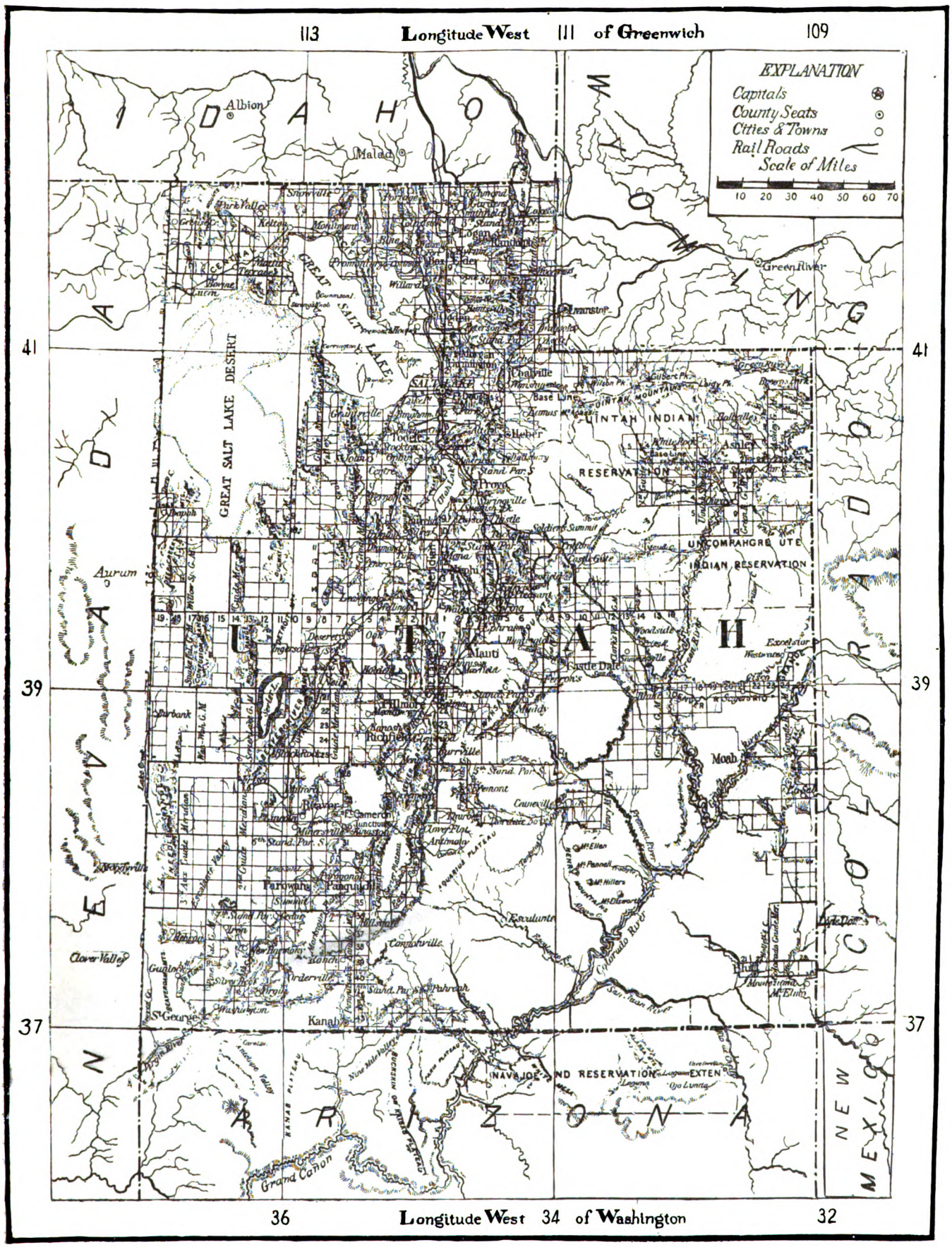
Utrecht. Ancient city of the Netherlands, on the "Old" Rhine. It has important manufactures, a large trade, two

Utrecht in 1820.

cathedrals, and a university, founded 1634, with ab. 700 students and a library of 160,000 vols. Pop., 1890, 86,116.

Utrecht, PEACE OF. Made up of nine separate treaties, signed April 11, 1713. It ended the war of the Spanish Succession; secured the separation of the French and Spanish crowns, the Protestant succession in England, and satisfaction for claims of the allies.

Utrecht, UNION OF. League of the seven Protestant provinces of n. Netherlands under William of Orange, 1579, for defense against Parma, who controlled the ten Catholic provinces.


113 Longitude West 111 of Greenwich 109
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60 70
IDAHO
WYOMING
NEVADA
COLORADO
ARIZONA
NEW MEXICO
UTAH
GREAT SALT LAKE DESERT
GREAT SALT LAKE
UINTAH INDIAN RESERVATION
UNCOMPAHGRE UTE INDIAN RESERVATION
NAVAJO INDIAN RESERVATION
Albion
Malad
Logan
Ogden
Salt Lake City
Provo
Manti
Fillmore
Beaver
Parowan
Cedar City
Kanab
St. George
Aurum
Clover Valley
Green River
Moab
Grand Canon
41
39
37
36 Longitude West 34 of Washington 32

Utricle. Indehiscent one-seeded dry fruit having a loose pericarp; bladder on the leaf of an aquatic plant.

Utriculate. Bladder-like, or furnished with bladders.

Uttlett, MARY ("MAXWELL GREY"). English novelist. *Silence of Dean Maitland*, 1890.

Uvarovite. See OUVAROVITE.

Uvula. See PALATE.

Uxmal. Ruined city of n.w. Yucatan, famous for its immense buildings, and important for archæological study, but imperfectly understood.

Uz, LAND OF. Country assigned to Job; identical with Batanæa, or Hauran, e. of the Jordan.

Uzbegs. See USBEKS.

Uzziah. Ninth successor of Solomon as king of Judah, ab. 810–758 B.C.

V

V. Term applied by Abercromby 1881 to that formation of isobars in which two curves form a cusp or sharp junction, usually between two areas of low pressure, or attending a line squall.

Vaal. River of S. Africa rising in the Drakenberg Mts. and emptying into the Orange River, after flowing 500 m. in a w.s.w. direction. It forms the northern boundary of the Orange Free State.

Vaca, ALVAR NUNEZ CABEZA DE, 1507–1564. Spanish explorer in Mexico 1528–36, and Paraguay 1538–44. His narrative appeared 1542.

Vaca de Castro, CRISTOVAL, 1492–1562. Viceroy of Peru 1540–44.

Vaccination. A century ago smallpox was the great destroyer of the human race. It was known that one attack prevented a second and many people were inoculated with the disease when in a state of health, and the disease could be better controlled, to render them immune. Dr. Edward Jenner (1749–1823), an English physician, had his attention called to the belief among the country people of Gloucestershire that an attack of cowpox rendered the person immune to smallpox. This was while he was a medical student, prior to 1770. He made a careful study of the subject after he entered upon practice and became convinced of its truth. He made his first vaccination in 1796. The value of his discovery was recognized, and as its employment became general, the number of cases of smallpox became fewer and its relative mortality became less. At the present time, many physicians after years of extended practice have never seen a case of smallpox. Cowpox (vaccinia) is a disease of the bovidæ, manifesting itself in an eruption on the udder. The virus, secured from the developed vesicle on a heifer, is inoculated by removing a small area of the epidermis of the arm, or other portion of the body, and applying the vaccine lymph to the denuded part. This, when it "takes," induces a well-marked eruption, and the individual is rendered immune to smallpox; or, if not entirely immune, the resulting attack is much lighter and seldom fatal. The protection from vaccination is lost after a time, and it is well to be vaccinated from time to time, especially should there be an outbreak of smallpox in the vicinity.

Vacciniaceæ. Natural family of flowering plants of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Gamopetalæ*, comprising 27 genera and ab. 230 species, growing commonly in marshes and moors of the temperate and cold regions of the n. hemisphere, and abundantly in the tropics of Asia and America. The Cranberry and Whortleberry are included here.

Vacuoles. Clear spaces or cavities in the protoplasm of cells.—In *Protozoa*, they are usually either food vacuoles containing food in some stage of digestion, or contractile vacuoles (see CONTRACTILE VESICLE).—In plant cells they are sap spaces.

Vacuum. Any portion of space void of matter. A perfect vacuum cannot be obtained with the air-pump. The Torricellian vacuum is nearly perfect, but contains the vapor of mercury. The air-pump reduces the pressure to $\frac{1}{1000}$ atm.; the Sprengel pump to $\frac{1}{1000000}$ atm.; by removing the vapors the pressure has been reduced to $\frac{1}{2000000000}$ atm.

Vacuum-Brake. See BRAKE, VACUUM.

Vacuum-Chamber. See AIR-CHAMBER.

Vacuum-Pan. Apparatus for evaporating liquids at low temperatures, invented by Howard, an Englishman, 1813. In sugar refineries the pan is made of copper, with a hemispherical top and bottom, connected with a cylinder. The bottom is sometimes double, steam circulating in the space between the two bottoms. Within the pan are several series of copper steam pipes. Connected with the top of the pan is a condenser, an iron box, with series of cold water pipes, by which the spray of sweet water from the pan is condensed. Connected with the latter is the condenser, a large iron box, where a shower of water condenses the steam, and, by its long tail pipe, assists in maintaining the vacuum in the pan. Beyond the condenser is the vacuum-pump which completes the vacuum. The sugar solution is evaporated by the heat of the steam in the steam-pipes and jacket at a temperature of 150° F., with a vacuum of 27 in., thus avoiding the risk of decomposing the sugar. These pans are used for condensing milk, glycerin, and other organic liquids.

Vacuum Process. Method of sinking foundations by exhausting the air from a hollow cylinder, in order to sink it in soft soil.

Vadantes. Wading or swimming legs of birds. They have unfeathered tibial regions.

Vadimonian Lake. In Umbria, Italy. Near it the Etruscans were totally defeated by Fabius 309 B.C., and by Dolabella 283 B.C.

Vaenius, OTHO. See VAN VEEN.

Vaga, PERINO DEL, 1500–1547. Florentine painter, one of Raphael's assistants, but influenced by Michelangelo in his later work, as shown by his frescoes, much injured, in the Doria Palace at Genoa.

Holy Conversation (Borghese Gallery), by Vaga.

Vagabundæ. Spiders that make no webs, but wander about seeking prey. See CITIGRADÆ.

Vagantes, or GOLIARDS. Wandering clerks of the Middle Ages. They flourished mostly in France and England during the 12th and 13th centuries. They became the terror of the community into which they came. They produced profane Latin poetry.

Vagina. See SHEATH.

Vagrants and Vagrancy. Vagrants are persons belonging to either of the classes who, by reason of having no fixed home or subsistence, and pursuing courses which tend toward crime, may by statute be confined and disciplined. These statutes give lists of various descriptions of persons who may be treated as vagrants. An act of Pa., passed 1879, distinguished a tramp from a vagrant, as being any person going from place to place, begging, asking, or subsisting upon charity, who shall have no fixed place of residence or lawful occupation in the city or county in which he shall be arrested.

Vagus Nerve. See PNEUMOGASTRIC NERVE.

Vahl, MARTIN, 1749–1804. Prof. of Botany in Copenhagen. *Symbolæ botanicæ*, 1790–94; *Eclogæ Americanæ*, 1796–1807; *Enumeratio plantarum*, 1804–6.

Vahlen, JOHANNES, b.1830. Prof. Vienna 1858, and Berlin 1874; editor of Aristotle's *Poetics* and other classics.

Vaiceshika Philosophy. One of the systems of Brahmanical philosophy.

Vail, ALFRED, 1807–1859. N. J. inventor, associated with Morse in developing the electric telegraph. — His brother, GEORGE, 1809–1875, was M.C. from N. J. 1853–57, and U. S. Consul at Glasgow 1858–61.

Vail, THOMAS HUBBARD, D.D., LL.D., 1812–1889. P. E. Bp. of Kansas 1864. *Comprehensive Ch.*, 1841.

Vaillant, LE. See LEVAILLANT, F.

Vaishnavas. Worshipers of Vishnu in Hindustan.

Valais, or WALLIS. S.w. Swiss canton. Area 2,027 sq. m.; pop., 1893, 103,236, chiefly R. C. and French; engaged in cattle-raising and agriculture.

Valckenaer, LODEWYCK KASPAR, 1715–1785. Prof. Franeker 1741, Leyden 1766; editor of sundry Greek texts. *Opuscula critica*, 1809; *Selecta*, 1817.

Valdes, ANTONIO JOSÉ, 1770–1824. Cuban historian.

Valdés, ARMANDO PALACIO. Spanish novelist; Marquis of Peñalta 1886. *Maximina*, tr. 1888. His *Origin of Thought*, tr. 1894, is a cumbrous satire.

Valdes, GABRIEL DE LA CONCEPTION, 1809–1844. Cuban poet of color, executed for alleged conspiracy.

Valdes, JUAN DE, 1500–1541. Spanish reformer, at Naples from 1533. He aimed to work within the R. C. Ch., not by withdrawal from it. Some of his books were tr. 1860–82.—His twin brother, ALONZO, 1500–1532, pub. a satire, *Lactantius*, 1527, and lived at Brussels. Both escaped the Inquisition.

Val-de-Travers. Valley in Switzerland, in which is Travers, in Neuchâtel. Here are asphalt mines.

Valdez Melendez. See MELENDEZ, VALDEZ JUAN.

Valdivia, PEDRO DE, ab.1500–1554. Spanish adventurer, companion of Pizarro; conqueror of Chili; founder of Santiago; killed by Araucanians.

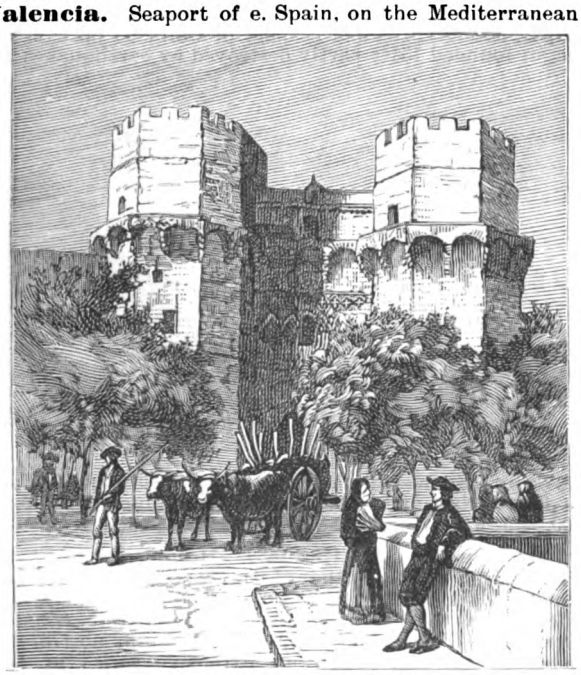
Valdivieso, JOSÉ DE, 16th cent. Spanish priest, author of biblical and allegorical plays, collected 1622.

Vale. In Scandinavian Mythology, son of Odin and Rind; also son of Loke and Sigyn.

Valence. That property of an element by virtue of which its atom has the power of holding a definite number of other atoms in combination. When hydrogen and chlorine unite, it is believed that one atom of each enter into combination: these elements are called univalent. If an element has the power to hold two hydrogen or two chlorine atoms in combination it is bivalent; *e.g.*, oxygen and calcium. Nitrogen is trivalent in NH_3, pentavalent in NH_4Cl. The highest valence is VIII.; *e.g.*, OsO_4. Valence is variable according to the conditions; thus nitrogen forms five different compounds with oxygen.

Valencia. City of Venezuela, on Lake Tacarigua. Pop. ab. 39,000.

Valencia. Seaport of e. Spain, on the Mediterranean at



The Puerta de Serranos, Valencia.

the mouth of the Guadalaviar; taken by Goths 413, Moors 715, by the Cid 1094, and by the French 1812. It manufactures silks and velvets, and exports grain and rice. It has a large commerce, and contains a university and a cathedral, in which are many noted works of art. Pop. ab. 170,000.

Valencia, DUKE OF. See NARVAEZ, R. M.

Valenciennes. Ancient town of n. France, on the Scheldt; part of Hainault till 1678; formerly noted for its lace. Froissart and Watteau were born here. Pop., 1891, 24,520.

Valenciennes, ACHILLE, 1794–1865. Prof. Paris 1830; coworker with Cuvier. *Poissons*, 22 vols., 1829–49; *Mollusques*, 1833.

Valens, FLAVIUS, ab.328–378. Emperor of the East from 364, brother of Valentinian; defeated and slain by Huns at Adrianople.

Valentine, BASIL, ab.1500. German alchemist. *Triumphwagen des Antimonii; Letztes Testament.*

Valentine, DAVID THOMAS, 1801–1869. Clerk of New York Common Council from 1837, and its historian. His *Manual* appeared annually from 1843.

Valentine, MILTON, D.D., LL.D., b.1825. Pres. Pa. Coll., Gettysburg, 1868–84; prof. theol. sem. there since 1884; writer on religious topics.

Valentine, ST. Roman presbyter, martyred 270. His day, Feb. 14, owes its peculiar observance to the festival LUPERCALIA (q.v.).

Valentines. Love-tokens accompanied by amatory verses, exchanged Feb. 14. They were formerly drawn, the names of boys and girls being written on slips. The origin of the custom is traced to usage among the Romans at the Lupercalia.

Valentinian I., 321–375. Emperor of the West from 364. —II., 371–392, his younger son and successor.—III., ab.419–455; son of Constantius III. and grandson of Theodosius; Emperor of the West from 425.

Valentinians. Followers of Valentinus, an Alexandrian Gnostic, at Rome ab.140–160.

Valentinite. See SENARMONTITE.

Valentinois, DUCHESS OF. See DIANA DE POITIERS.

Valera y Alcalá-Galiano, JUAN, b.1824. Spanish novelist, poet, critic, diplomatist, and minister of state. *Estudios críticos*, 1864–88; *Pepita Jiménez*, 1874, tr. 1891; *Doña Luz*, 1878; *Cuentos*, 1882.

Valerian. Herbs of the genus *Valeriana*, natural family *Valerianaceæ*, bearing small flowers in panicles and strong-scented roots; of wide geographical distribution; cultivated for their medicinal properties and for ornament.

Valerian (*Valeriana officinalis*).

Valerian, GREEK. Herbs of the genus *Polemonium*, of the Phlox family, natives of the cooler portions of the n. hemisphere.

Valerianaceæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Gamopetalæ*, comprising 9 genera and ab.275 species, distributed throughout all parts of the earth except Australia; called the Valerian family.

Valerianus, PUBLIUS LICINIUS, ab.190–263. Roman emperor 253–260; defeated and made prisoner by the Persians. The tales of his being used as a horseblock by Sapor, and his stuffed skin kept in a temple, are doubtful.

Valeric Acids. $C_5H_{10}O_2$. Monobasic acids of the acetic acid series, existing in four forms. The common one is the isovaleric acid, which is found free and combined in the animal and vegetable kingdoms. The main sources are the valerian and the angelica root. It is a liquid with an unpleasant odor, bpt. 175° C., used in the manufacture of its compound ethers for flavors and perfumery. Ammonium valerate has a disgusting odor, and is used in medicine.

Valerius, ANTIAS, 1st cent. B.C. Historian of Rome, who wrote its history down to Sulla in ab. 75 vols. He exaggerated largely.

Valerius, MAXIMUS, 1st cent. Roman author of *De Factis Dictisque Memorabilibus*, in nine books, a collection of historical anecdotes.

Valerius, PROBUS. See PROBUS, M. A.

Valerius Flaccus, GAIUS. See FLACCUS, G. V.

Valetta. Capital of Malta; on n.e. coast; founded ab.1566. It has two good harbors, and is well fortified. The town is

built mainly on a rocky peninsula and the ground is so uneven that the streets are connected by stairs. It has a large depot

Valetta, Malta.

of coal, and is the headquarters of the British fleet in the Mediterranean. It was occupied by the French 1798 and passed to the English 1801. Pop., 1891, 37,350, or, with suburbs, 62,152.

Valette, JEAN PARISOT DE LA, 1494–1568. Grandmaster Knights of St. John 1557; defender of Malta against the Turks May 18–Sept. 8, 1565.

Valgius Rufus, b.81 B.C. Roman author, in prose and verse, under Augustus; Consul 12 B.C.; friend of Horace.

Valhalla. Hall of immortality, in Scandinavian mythology, for heroes who fell in battle; described as situated in Gladsheim, large and resplendent with gold. The heroes pass their days there in feasting.

Valkyries. Maids sent by Odin to choose those who are to be slain, and carry them heroes to Valhalla, where they bear drink, take care of the drinking-horns, and serve the table.

Valla, LAURENTIUS (LORENZO DELLA VALLE), 1405–1457. Italian scholar, rationalist, and polemic, a chief herald and promoter of the Renaissance; prof. at Rome 1450; translator of Herodotus, Thucydides, and Xenophon; N. T. critic. *De Donatione Constantini*, 1440; *Elegantiæ Latinæ*, 1444.

Valladolid. Old city of n. Spain, on the Pisuerga; royal residence ab.1400–1560; held by the French 1808–10. Its univ.,

House in Valladolid where Columbus died, 1506.

founded 1346, has ab. 900 students. It has some manufactures of silk and wool and a fair grain trade. Pop. ab. 65,000.

Vallancey, CHARLES, LL.D., 1722–1812. English officer and antiquarian, writing on Ireland. *De Rebus Hibernicis*, 6 vols., 1770–1808.

Vallandigham, CLEMENT LAIRD, 1820–1871. M.C. from Ohio 1857–63. He opposed the prosecution of the Civil War and attacked the government, was tried by court-martial and carried across the lines. After a stay in Canada, he was candidate for Gov. of Ohio 1864. He expended much ability and earnestness on a hopeless cause.

Vallauri, TOMMASO, b.1805. Prof. Turin 1843; editor of Latin classics; writer on Piedmontese literature. *Opuscula*, 1875.

Vallentine, BENJAMIN BENNATON, b.1843. Anglo-American journalist, satirist, and playwright.

Valleria, ALWINA (LOHMANN), b.1848. American singer.

Valley. Internal angle formed by the meeting of the sides of a roof, where there is more than one ridge.—Space between the ridges of a vault as seen from above.

Valley Forge. Village 24 m. w. of Phila.; scene of Washington's encampment in the winter of 1777–78. His force of 11,000 men was ill supplied with food and clothing.

Valley Rains. Rain produced by hot moist air rising from valleys; term used by Abercromby.

Valleys. Depressions of the earth's surface generally with sloping sides. They have been formed by wrinkling of the earth's crust by internal forces; by volcanic eruptions; by erosion of plateaus by water or ice.

Vallombrosa. Benedictine abbey in the Apennines, founded 1039; first to admit lay brothers; noticed by Ariosto and Milton; suppressed 1869, and its fine buildings secularized.

Valmiki, ab.900 B.C. Epic poet of India.

Valmore, MARCELINE FÉLICITÉ JOSÈPHE (DESBORDES), 1785–1859, m.1817. French singer, poet, and novelist.

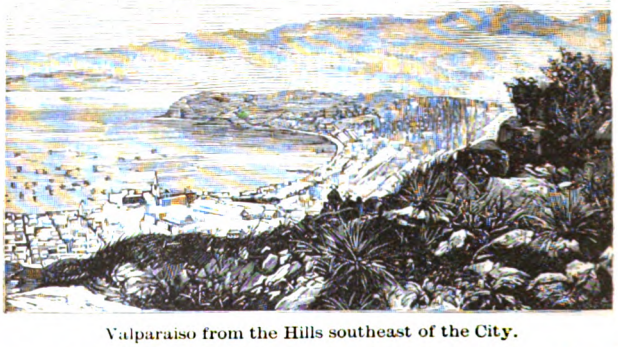
Valmy. Village of n.e. France, 20 m. n.e. of Chalons. Here, Sept. 20, 1792, the French Republicans under Kellerman defeated the Prussian invaders, deciding the campaign.

Valmy, FRANÇOIS CHRISTOPHE KELLERMAN, DUC DE, 1735–1820. Bavarian general, in the French service; victor at Valmy 1792; imprisoned 1793–94; Duke 1804.—His son, FRANÇOIS ÉTIENNE, 1770–1835, was prominent at Marengo and Austerlitz.

Valois Dynasty, 1327–1589. Named from a portion of Isle de France (Oise), given by Philip III. to his youngest son Charles, 1270–1325. His son became king as Philip VI. 1327. The house is subdivided into (1) older Valois, direct line, 1327–1498, with 7 kings, ending with Charles VIII.; (2) Valois-Orleans, Louis XII., 1498–1515; (3) Valois-Angoulême, 1515–89, 5 kings, Francis I. to Henry III. The Valois claim to the throne was disputed by Edward III. of England, son of Isabella, daughter of Philip IV. of France: this claim occasioned the 100 Years' War. The marriage of Charles of Valois with Margaret of Anjou-Sicily brought a claim to the Two Sicilies, which was pressed by Charles VIII. and his immediate successors, and involved Europe in numerous wars. The dynasty ended with the assassination of Henry III.

Valonia. Vegetable product rich in tannic acid and used by tanners. It is the acorn cup of a species of oak, *Quercus ægilops*, found in Greece and Turkey.

Valparaiso. Principal seaport of Chili, 68 m. w.n.w. of Santiago; founded 1544; partly destroyed by earthquakes 1822



Valparaiso from the Hills southeast of the City.

and 1851, by a Spanish fleet 1866, and by insurgents 1891. It has a fine harbor and a large foreign commerce. Pop. ab. 150,000.

Valpy, RICHARD, D.D., 1754–1838. Headmaster of Reading School, Eng., 1781–1830; author of widely used Greek and Latin grammars.—His brother, EDWARD, 1764–1832, headmaster at Norwich, edited the Greek Testament 1810, and pub. *Elegantiæ Latinæ*, 1803.—Their nephew, ABRAHAM JOHN, ab.1787–1854, publisher in London, issued an extensive series of Latin authors, a *Family Classical Library*, and other important works.

Value in Exchange. Power which an article confers

upon its possessor of commanding the labor, or the products of the labor, of others. Value alone should be equivalent to this, though it is sometimes confused with utility.

Value in Use. Equivalent of utility; power which any article possesses of satisfying some human want.

Valvate. Manner of æstivation, where the margins of the sepals merely touch without overlapping, as in the Hollyhock.

Valve. In Botany, one of the separating parts of a dehiscing capsule.—In Zoölogy, one of the parts of a diatom-shell.

Valverde, VICENTE, ab.1490–1543. Spanish Dominican, in Peru ab.1530–34, and from 1536 as Bp. of Cuzco. He attempted the conversion of Inca Atahualpa, and caused his arrest and execution 1532–33. As inquisitor and Protector of the Indians he cruelly oppressed the natives, who rose in despair and slew him.

Valves. Means of closure of openings in pipes through which fluids move. Valves lift or slide, and are automatic or are opened from outside. Automatic lifting valves are represented by all pump and check-valves (see CHECK, CORNISH and POPPET VALVES); non-automatic are the usual globe valves, in which the spindle of the valve is fitted with a screw, and by turning that spindle the valve rises from its seat. The stem has a STUFFING-BOX (q.v.) to keep it tight. Sliding valves are represented by the engine SLIDE-VALVE (q.v.), plug-cock, and gate-valves. Cocks are conical frusta with a hole through them, which fit a taper casing in which are openings from the pipe. The cock opens when the holes in the frustrum slide opposite to those in the seat. Such cocks may be 3-way. The taper is ab. 1 in 32, and is given so that the fit may be ground anew as it becomes unequally worn, owing to unequal wearing areas. Gate or straight-way valves have disks which slide in guides across the section of the casing, and when withdrawn open the entire area of the pipe. The gate is made double, and is forced tight to its two seats by the wedging action, which may be caused as the spindle is crowded down after the disks have bottomed. Throttle valves are usually poppet or slide valves: sometimes in steamboat practice a simple disk pivoted on a diameter is made to fit a seat in the section of the pipe. Angle valves have one outlet at bottom and one at side. A cross valve opens an inlet from the bottom to two outlets at the sides, by lifting the disk with screw-spindle and hand-wheel. Valves operate by right-handed screws usually; a few large ones use left-screws.

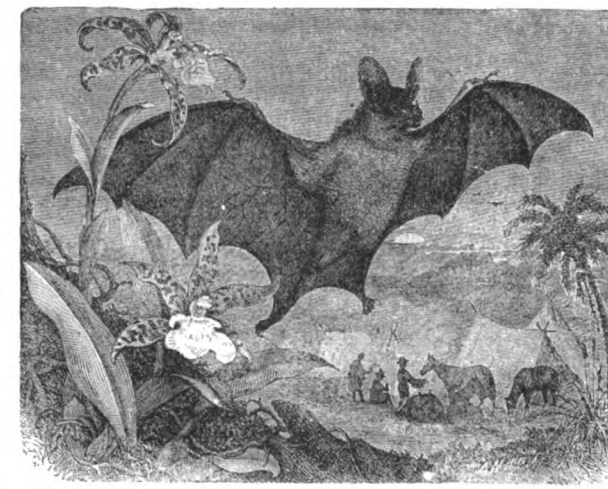
Valves, MITRAL. Pair of membranous folds in the left ventricle of the heart, at the opening from the left auricle. When the blood flowing from the auricle fills the ventricle and it contracts, it forces the blood into these folds, causing them to close the opening, preventing the return of the blood into the auricle, enabling it to be forced through the aorta into the circulatory system. Sometimes through disease these valves do not properly close, permitting a leakage, causing what is known as a mitral regurgitant murmur.

Valves of the Heart. The heart as a hydraulic apparatus receives and pumps the blood into the arteries, and the mechanisms preventing the back flow are known as the valves of the heart. The venous blood enters the right auricle, whence it flows into the empty right ventricle. When the ventricle contracts to force the blood into the pulmonary artery, it presses against three membranous folds, situated on the ventricle side of the opening from the auricle, which close the opening and prevent the return of the blood; these are called the tricuspid valves. In the same way the blood from the left ventricle is prevented from flowing back into the left auricle by the mitral valve, consisting of two membranous folds. The blood cannot flow back from the pulmonary artery or the aorta into the dilating ventricles, because of the semilunar valves, three membranous folds found in the arteries at their insertion into the heart. Disease frequently produces a condition causing a leakage of the valves, which is recognized by the production of a peculiar murmur, known as a regurgitant murmur.

Vambéry, ARMINIUS, b.1832 in Hungary. Traveler in central Asia; prof. Pesth 1865; prolific writer on Oriental ethnology and philology. His *Travels and Adventures*, 1864, described regions previously unvisited by Europeans.

Vampire. Supposititious monster, usually a witch, suicide, or person excommunicated, who rose from the grave to feed on human blood. This hideous superstition prevailed in the Dark Ages, and was revived in e. and central Europe ab. 1710.

Vampire Bats. True Vampires are small bats of the family *Desmodontidæ* of S. and Central America, which subsist solely by sucking the blood of mammals while asleep or resting. They make the blood flow by shaving off the skin surface sufficiently, by means of a pair of sharp, projecting upper incisors. Their molars are rudimentary. They are related to the *Phyllostomidæ*, like them having a nose-leaf.



Vampire (*Phyllostoma spectrum*).

Their stomach is very slender, but bears a long cardiac cæcum for storing blood. The false Vampires are large, frugivorous, phyllostomine bats, as *Vampyrus spectrum* of S. America: allied species exist in the Old World. False Vampires are harmless.

Vampyrella. Animalcule, one of the *Lepomonera*. It lives upon confervoid *Algæ* by piercing the cell-wall and sucking out the contents.

Vampyrelleæ. Order of *Myxomycetes*.

Van. Armenian-Turkish town, 145 m. s.e. of Erzerum, on Lake Van, which is brackish, and in area ab.1,200 sq. m. It has some manufactures. Pop. ab.35,000.

Vanadates. Salts of vanadic acid.

Vanadic Acid. H_3VO_4. Not known in free condition.

Vanadic Acid, META. HVO_3. Beautiful golden-yellow compound, obtained by boiling copper vanadate with sulphurous acid; used as a substitute for gold bronze.

Vanadic Anhydride. V_2O_5. Vanadium Pentoxide. Found in three forms, yellow, red, and crystalline; made by heating ammonium vanadate.

Vanadinite. $3Pb_3V_2O_8+PbCl_2$. Mineral lead vanadate and chloride, found in very small quantity in several localities, and relatively abundant in Arizona and New Mexico.

Vanadite. Same as DESCLOIZITE (q.v.).

Vanadium. V. At. wt. 51.4, sp. gr. 5.5, valence III.–V. Rare element, discovered by Del Rio 1801; found in nature principally as lead and copper salts of vanadic acid and in some iron ores; obtained from its ores by treating with hydrochloric acid and evaporating in presence of an excess of ammonium chloride. The ammonium metavanadate thus obtained is converted into the pentoxide, which is then reduced by hydrogen. It is a light, whitish-gray powder, oxidizing slowly in the air, soluble in hydrofluoric acid. It forms five oxides, similar to those of nitrogen.

Vanadium Chlorides. VCl_4. Tetrachloride: dark, brownish red, thick liquid; bpt. 154° C., sp. gr. 1.85; made by treating the metal with chlorine. There are also a di- and trichloride.

Vanadium Oxides. These are represented by V_2O, V_2O_2, V_2O_3, V_2O_4 and V_2O_5. They are all rare. The pentoxide is the most important: it crystallizes in yellowish-red rhombic prisms, and is prepared from mottramite.

Vanadium Oxychloride. $VOCl_3$. Yellow fuming liquid, made by passing chlorine over a heated mixture of vanadium pentoxide and charcoal.

Vanadium Sulphides. Disulphide. V_2S_2. Brownish black powder; sp. gr. 4.2 to 4.4; not acted upon by boiling hydrochloric acid; made by treating the trisulphide with hydrogen.—Trisulphide. V_2S_3. Black leaflets or gray powder; made by heating the trioxide in a stream of hydrogen sulphide.—Pentasulphide. V_2S_5. Black powder, made by heating the trisulphide with sulphur; soluble in ammonium sulphide.

Vanadium Tribromide. VBr_3. Grayish, amorphous,

opaque sublimate, made by heating a mixture of carbon and the sesquioxide in presence of bromine.

Van Bemmel, EUGÈNE, 1824–1880. Prof. Brussels 1849; critical and biographical writer.

Van Beneden, PIERRE JOSEPH, 1801–1894. Prof. Louvain; writer on zoölogy, as is also his son, EDOUARD, b.1846, prof. Liège.

Vanbrugh, SIR JOHN, ab.1666–1726. English dramatist and architect, knighted 1714; builder of Blenheim palace. His comedies, *The Relapse*, 1697, *Provoked Wife*, 1698, *Confederacy*, 1705, and his last play, *Journey to London*, completed as *Provoked Husband* by Cibber, are vigorous, easy, and indecent.

Van Brunt, GERSHOM JAQUES, U.S.N., 1798–1863. Captain 1855, Commodore 1862; active on N. C. and Va. coast. —His son, HENRY, b.1832, was the architect of Harvard Memorial Hall (with W. R. Ware), and of many other buildings.

Van Buren, MARTIN, 1782–1862. Eighth Pres. of the U. S.; U. S. Senator 1821–28; Gov. of N. Y. 1828; Sec. of State 1829–31; Minister to England 1831, but not confirmed. He was Vice-Pres. 1833–37; Pres. 1837–41. The country was in distressed

Martin Van Buren.

financial condition during his administration, and his policy was unpopular with the masses. He was an unsuccessful candidate for the presidency 1840 and 1848.—His son, JOHN (PRINCE JOHN), 1810–1866, was a noted lawyer.

Van Buren, WILLIAM HOLME, M.D., LL.D., 1819–1883. Prof. Univ. New York 1852, and Bellevue 1866. *Surgery*, 1865.

Vance, JOSEPH, 1786–1852. M.C. 1823–35 and 1843–47; Gov. of Ohio 1836–38.

Vance, ZEBULON BAIRD, 1830–1894. M.C. 1858–61; Gov. of N. C. 1862–66 and 1876–78; U. S. Senator from 1879.

Van Cortlandt, OLOFF STEVENSE, 1600–1684. Dutch emigrant 1638; burgomaster of New York 1655–64.—His son, STEPHANUS, 1643–1700, was Mayor from 1677, and long a judge.—His grandson, PIERRE, 1721–1814, was Lieut.-gov. of N. Y. from 1777.—His son, PHILIP, 1749–1821, was an officer in the Revolutionary War, and M.C. 1793–1809.

Vancouver. Capital of Clarke co., Wash., on Willamette River, 6 m. above mouth, 6 m. n. of Portland, Ore. Founded 1828; headquarters of military department of the Columbia. Products lumber, fruit and dairy. Pop., 1890, 3,545.

Vancouver. City of British Columbia, 85 m. n. by e. of Victoria, on Buzzard Inlet. It is the terminus of the Canadian Pacific R. R., and has a steamship service to China, Japan, San Francisco and Alaska. Pop., 1891, 13,685.

Vancouver, GEORGE, R.N., 1758–1798. Officer under Cook 1771–80; explorer of n. Pacific coasts 1791–94. *Voyage of Discovery*, 1798.

Vancouver Island. Part of British Columbia; in the Pacific, lat. 48° 19′—50° 53′ N.; discovered 1592 by Apostolos Valerianos, or Juan de Fuca, a Greek in the service of Spain. In 1844 it was settled by the Hudson's Bay Co., to which the whole island was assigned in 1849; in 1858 it was bought back

Vancouver Island.

by the crown and in 1866 united with British Columbia. The industries are coal-mining, lumber, fishing and shipbuilding. Area ab.16,000 sq. m.; pop., 1891, 37,000.

Van Curler, or **Van Corlear,** ARENDT, ab.1600–1667. Dutch emigrant 1630; founder of Schenectady, N. Y., 1661; of great influence with the Indians, and thus important in Colonial history.

Vandals. Gothic tribe, who moved s. from a region near the Baltic, and became Arians in Pannonia. They entered Gaul 406, Spain 409, and Africa 429; were victorious and destructive under Genseric, who sacked Rome 455; and were overthrown 533 near Carthage by Belisarius.

Vam Dam, RIP, ab.1662–ab.1738. Councilor of N. Y. from 1707; Acting-gov. 1731 and 1736.

Vandamme, DOMINIQUE JOSEPH, 1771–1830. French general 1793; active at Austerlitz and in Silesia; made Comte d'Huningen; in America 1815–24.

Vandegrift, MARGARET. See JANVIER.

Vandenhoff, GEORGE, b.1820. Anglo-American actor, elocutionist and author.—His wife (MAKEATH), m.1855, d.1883, was an actress of merit.

Van Depoele, CHARLES J., 1844–1892. Belgian-American inventor of trolley cars. The first line was established at South Bend, Ind., 1882.

Vanderbilt, CORNELIUS, 1794–1877. Called "Commodore" from his boats plying on the Hudson and Long Island Sound. In 1863 he gave to the U. S. Government his finest steamer, the *Vanderbilt*, which had cost $800,000. He gained control successively of the N. Y. and Harlem, Hudson River, and N. Y. Central railroads, in 1869 consolidated these, and in 1873 controlled 2,000 miles of track. He left a fortune estimated at $100,000,000.—His son, WILLIAM HENRY, 1821–1885, and grandson, CORNELIUS, b. 1843, succeeded to the control of his roads.

Vanderbilt University. At Nashville, Tenn.; founded 1872, under control of the M. E. Ch. South. C. Vanderbilt gave it $1,000,000; his son and grandson added $500,000. It is co-educational, and has 70 instructors and ab.700 students. It maintains, besides the academic courses, schools of law, medicine, theology, and engineering.

Vanderdecken. See FLYING DUTCHMAN.

Van der Goes, HUGO, ab.1405–1482. Flemish painter.

Vanderheyden, DIRK, ab.1680–1738. Grantee of the site of Troy, N. Y., 1720. His house, built 1725, was described by Irving in *Bracebridge Hall*.

Van der Heyden, JAN, 1637–1712. Dutch painter.

Van der Hoeven, JAN, 1801–1868. Prof. Leyden 1826; writer on zoölogy.

Vanderlyn, JOHN, 1776–1852. American painter of superior talent. Few accessible works of his are extant.

Van der Meer, JAN, ab.1625–ab.1685. Dutch landscape and marine painter, as was also his son, JAN, ab. 1660–ab. 1704.

Van der Meulen, ANTOINE FRANÇOIS, 1634–1690. Belgian-French historical painter.

Vanderpool, AARON, 1799–1871. M.C. 1833–37 and 1839–

41; Judge N. Y. Superior Court 1842–50.—His nephew, AARON J., LL.D., 1825–1887, was prominent at the New York bar.

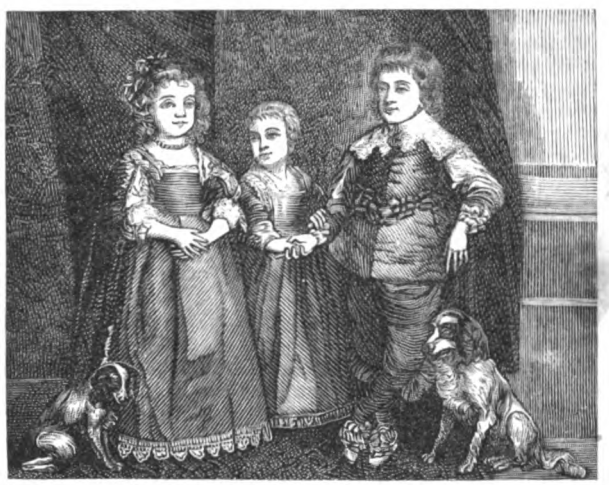
Van der Stucken, FRANK, b.1858 in Texas. Conductor Breslau Theater 1881–82, Männergesangverein Arion, New York, 1884–95, and Cincinnati Orchestra 1895; composer of an opera, *Vlasda*, music for Shakespeare's *Tempest*, overture to Heine's *Ratcliff*, etc.

Van de Velde, WILLEM, 1610–1693. Dutch marine painter, in England from 1675.—His son, WILLEM, 1633–1707, followed in his steps with still greater success.—His brother, ADRIAAN, 1639–1672, painted landscapes and animals.

Van Diemen's Land. See TASMANIA.

Van Dorn, EARL, 1820–1863. Major U.S.A. 1860; Major-gen. C.S.A. 1861; defeated at Pea Ridge, Ark., and Corinth, Miss., 1862.

Van Dyck, or **Van Dyke,** SIR ANTHONY, 1599–1641. Flemish painter, in England from 1632; pupil of Rubens, and superior to him in color, but not in strength of conception. The sentiment of his religious paintings is rather weak: in portraits he is at his best, and a master of the first rank. The *Children*



Children of Charles I., by Van Dyck.

of Charles I. in Dresden, similar paintings in Amsterdam, in Turin, and at Windsor, and the portrait of *Charles I.* in the Louvre, are among his greatest works. The Antwerp Gallery is especially rich in fine specimens. Several are in the Metropolitan Museum of New York.

Van Dyke, HENRY, D.D., b.1852. Presb. pastor in New York since 1882. *Poetry of Tennyson*, 1889–94; *Christ-Child in Art*, 1894; *Little Rivers*, 1895; *Age of Doubt*, 1896.—His father, HENRY JACKSON, D.D., 1822–1891, pastor in Brooklyn from 1853, pub. *The Church*, 1890.

Van Dyke, JOHN, 1807–1878. M.C. 1847–51; Judge N. J. Supreme Court 1859–66; Judge in Minn. 1868.—Of his sons, THEODORE STRONG, b.1842, has written on Cal., and JOHN CHARLES, b.1856, prof. of Art, Rutgers, 1891.

Van Dyke, NICHOLAS, 1738–1789. Delegate to Congress 1777–83; Pres. of Delaware 1783–86.—His son, NICHOLAS, 1769–1826, was M.C. 1807–11, and U. S. Senator from 1817.

Vane. Plate of metal turning on a vertical spindle to show the direction of the wind, fixed to the tops of spires and pinnacles; often in the form of a cock, hence called a weather-cock. They were in use by the Saxons, sometimes heraldic devices. In the Perpendicular and Elizabethan styles figures supported the vanes in elevated situations.

Vane (OF FEATHERS). See VEXILLUM.

Vane, CHARLES W. See LONDONDERRY, MARQUIS OF.

Vane, SIR HENRY, 1612–1662. English Puritan, in Mass. 1635–37; Gov. 1636; M.P., knight, and treasurer of the navy 1640; Republican leader, active in public affairs till 1653; opposed to Cromwell as Protector; imprisoned 1656 and from 1660; executed for alleged high-treason. His writings are mystical and millenarian.

Van Eyck. See EYCK.

Van Helmont, JAN BAPTISTA, 1577–1644. Dutch iatrochemist. *Pharmacopolium ac Dispensatorium Modernum; Ortus Medicinæ, vel Opera Omnia*, 1648.

Vanilla. *Vanilla planifolia.* Epiphyte of the Orchid family, native of tropical America. Its fruit is collected in quantity and furnishes the well-known flavoring substance. The fruit is a pulpy pod ab. 6 to 12 in. long and ½ in. thick, containing many black seeds. The best comes from Mexico, and contains from 1.7 to 2 per cent vanillin. Sweetened tincture of the dried fruit in alcohol is used for flavoring.

Vanilla (*Vanilla planifolia*).

Vanilla-Plant. *Trilisia odoratissima.* Tall herb of the Composite family, bearing purple flowers and foliage with the odor of vanilla; native of the s.e. U. S.

Vanillin. $C_6H_3 : OH,OCH_3,CHO$. Compound at once aldehyde and phenol, derived from benzene; beautiful needles of vanilla odor; mpt. 81°C.; present in the vanilla bean, from which it is prepared, and in numerous other plants; also prepared by the oxidation of coniferin.

Vanini, LUCILIO, 1585–1619. Italian rationalist, falsely accused of atheism and burned at Toulouse. *Amphitheatrum æternæ Providentiæ*, 1615; *De Admirandis Naturæ Arcanis*, 1616.

Vanishing Fraction. One having for some value of its variable the indeterminate form $\frac{0}{0}$; as $\frac{x^2-a^2}{x-a}$, in which, if $x=a$, each term of the fraction becomes zero. Such fractions may, in some cases, be evaluated algebraically by dividing both terms by a common factor: in other cases the differential calculus is required.

Vanity. Readiness to believe that one is admired, and elation of spirit accompanying such belief.

Van Laun, HENRY, 1820–1896. Dutch scholar in Great Britain from ab. 1845; teacher in Edinburgh; tr. of Taine's *Hist. English Literature*, 1872–73, of Molière, 1875–76, and of *Gil Blas*, 1885–86. *Hist. French Literature*, 3 vols., 1876–77; *French Revolutionary Epoch, 1774–1870*, 1879.

Van Lennep, HENRY JOHN, D.D., 1815–1889. American missionary in Turkey 1839–69. *Travels in Asia Minor*, 1870; *Bible Lands*, 1875.

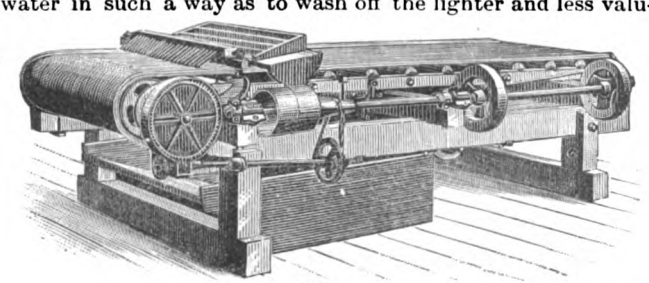
Van Lennep, JACOB. See LENNEP, J.

Van Loo, CHARLES ANDRÉ, 1705–1765. French decadence painter.—His brother, JEAN BAPTISTE, 1684–1745, gained eminence by his portraits in Italy, London, and Paris, and was admitted to the French Academy 1731.

Van Marcke, ÉMILE, 1827–1890. French painter.

Van Mildert, WILLIAM, D.D., 1765–1836. Prof. Oxford 1813; Dean of St. Paul's 1820; Bp. of Llandaff 1819, and of Durham 1826. *Historical View of Infidelity*, 1806; *Scripture Interpretation*, 1815.

Vanner. Ore-testing or ore-dressing apparatus on which the ore, in the shape of a fine sand or pulp, is agitated with water in such a way as to wash off the lighter and less valu-



Vanner.

able portions and to collect the richer grains by themselves. In hand-vanning a shovel is used, to which a peculiar jerky and rotary motion, to be learned only by practice, is given. Many machines of this general type are in use.

Van Ness, CORNELIUS PETER, LL.D., 1782–1852. Chief-justice of Vt. 1821–23; Gov. 1823–29; U. S. Minister to Spain 1829–37.—His brother, WILLIAM PETER, 1778–1826, was Burr's second in the duel with Hamilton 1804, and U. S. judge for s.

N. Y. from 1812.—His cousin, WILLIAM W., 1776–1826, was Justice N. Y. Supreme Court 1807–22.

Van Nostrand, DAVID, 1811–1886. Publisher of scientific books in New York; founder *Engineering Mag.* 1869.

Vannucci. See PERUGINO.

Vannuchi. Family name of SARTO (q.v.).

Van Oosterzee, JAN. See OOSTERZEE, JAN.

Van Ostade. See OSTADE.

Van Rensselaer, HENRY KILLIAN, 1744–1816. Great-great-grandson of Killian; Col. of N. Y. troops; distinguished in battles with Burgoyne 1777.—His son, SOLOMON, 1774–1852, served with distinction in Wayne's Ohio campaign 1794, and at Queenston 1812. He was M.C. from N. Y. 1819–22.

Van Rensselaer, MARIANA (GRISWOLD), b.1851, m.1874. American writer on art and architecture.

Van Rensselaer, STEPHEN, 1765–1839. Eighth patroon; inheritor of the American estates of Killian Van Rensselaer (1595–1644) of Amsterdam, who bought 1630 a tract on both sides of the Hudson, 24 by 48 m., including Albany and Rensselaer counties; Lieut.-gov. 1795; Major-gen. 1801; member of Constitutional Convention 1821; M.C. 1823–29; pres. of the boards in control of Erie and Champlain canals 1811–25; founder of the Rensselaer Polytechnic Institute at Troy 1824.—His son, STEPHEN, 1789–1868, was the last patroon. The anti-rent movement began 1839, and soon led to riot and bloodshed. In 1847–48 it formed an important issue in State politics; but was quieted by a decision of the Court of Appeals 1852, which favored the recusant tenants.

Van Santvoord, GEORGE, 1819–1863. N. Y. lawyer. *Pleading in Civil Actions*, 1852–54; *Lives of Chief Justices*, 1854; *Equity Actions*, 1860–62.

Van Schaack, PETER, LL.D., 1747–1832. Lawyer of Kinderhook, N. Y. *Laws of N. Y.*, 1773; *Conductor Generalis*, 1788.

Van Schooten, FRANK, 1620–1661. Prof. Leyden; ed. Descartes' *Geometry* and Vieta's works.

Vansittart, HENRY, R.N., 1779–1844. Rear-admiral 1830.

Vansittart, NICHOLAS, 1766–1851. M.P. 1796; diplomatist; Chancellor of the Exchequer 1812; Baron Bexley 1823.

Van Tromp. See TROMP.

Van Twiller, WOUTER, ab.1580–ab.1650. Gov. of New Netherlands 1633–37; involved in difficulties with Mass.; noted for lavish expenditures.

Vanuxem, LARDNER, 1792–1848. Prof. S. C. Coll. 1820–26; geologist of 3d district of N. Y. 1836–41; author of a Report on the same 1842.

Vanuxemite. Clayey product of the decomposition of some of the zinc ores in n.w. N. J.

Van Valkenburg, ROBERT BRUCE, 1821–1888. M.C. from N. Y. 1861–65; U. S. Minister to Japan 1866–69; Justice Fla. Supreme Court from 1872.

Van Veen, OCTAVIO, 1558–1629. Dutch historical and portrait painter of the Flemish school. At Antwerp he painted for the churches and had Rubens for his pupil. He was a good poet and scholar, publishing several books, which he illustrated himself. He is known by various names; the name Van Veen being sometimes given to HEEMSKERK (q.v.).

Nothing lasts so that everything may last, by Van Veen.

Vanvitelli, LUIGI, 1700–1773. Neapolitan architect of Dutch parentage.

Van Winkle, PETER G., 1808–1872. U. S. Senator from W. Va. 1863–69.

Van Winkle, RIP. See RIP VAN WINKLE.

Van Wyck, CHARLES HENRY, 1824–1895. M.C. from N. Y. 1859–63 and 1867–71; U. S. Senator from Neb. 1881–87.

Van Zandt, MARIE, b.1861 in Tex. Opera singer.

Van Zile, EDWARD S., b.1863. American novelist. *Manhattaners*, 1896.

Vapereau, LOUIS GUSTAVE, b.1819. French lexicographer and historian of literature. *Année littéraire et dramatique*, 11 vols., 1859–69.

Vapor. Gas near its liquefying point. If the gas be partly condensed or be just at the condensing point, it is called a saturated vapor; in general, a saturated vapor is one in contact with its liquid. The term vapor is often used in a much wider sense: all gases are frequently called unsaturated vapors.

Vaporization. Process of changing a liquid into a vapor. See EVAPORATION and EBULLITION.

Vapor Tension. Pressure exerted by a vapor on the surface of its liquid and the walls of the containing vessel; better called vapor pressure. It is different for the different vapors, and proportional to the temperature. Carefully prepared tables give the results of numerous experiments for many different vapors and for the various temperatures.

Varahran. See BAHRAM.

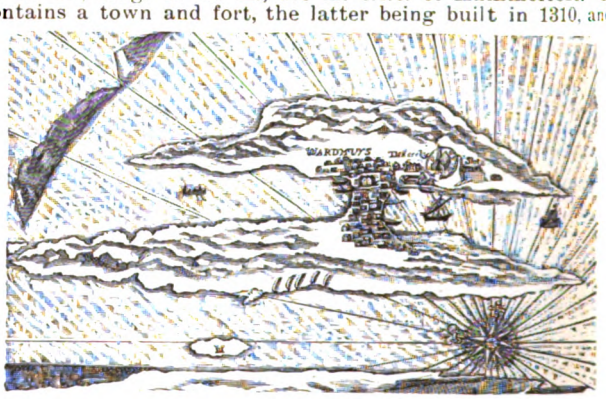
Varangians. Scandinavian invaders of Russia, who settled at Novgorod in 862 and became the ruling class; so named by Nestor.

Varano, ALFONSO, MARQUIS DE, 1705–1788. Italian Dantesque poet.

Varas, ANTONIO, 1817–1886. Chilian jurist; Minister of Justice 1845–50; Premier 1850–56 and 1861.

Varchi, BENEDETTO, 1503–1565. Florentine poet, critic, and historian.

Vardö. Island of Norway, in the Arctic Ocean, in lat. 70° 20′ N., long. 31° 10′ E., 175 m. e.s.e. of Hammerfest. It contains a town and fort, the latter being built in 1310, and exports salt and dried fish, whale and cod oil, guano, etc. It is one of the most northerly inhabited towns of Europe. Pop. ab. 3,000.



Vardo in 1594.

Varela, FLORENCIO, 1807–1848. Argentine author and journalist, as is also his son, HECTOR FLORENCIO, b. 1832.

Varela y Morales, FÉLIX, 1788–1853. Cuban priest and author, in New York 1824–49. *Filosofia*, 1819.

Vargas, JOSÉ MARIA, 1786–1854. Venezuelan physician and legislator; rector Univ. of Caracas 1827; Pres. 1835–36; Senator 1838–46.

Vargas, LUIS DE, 1502–1568. Spanish painter, chiefly of biblical scenes.

Vargas y Ponce, JUAN JOSÉ, 1755–1821. Spanish geographer.

Variability. Changes above or below a normal condition; changeability or uncertainty of any phenomena; expressed by a COEFFICIENT (q.v.) of variability. The relative variability of any climatic element at any two stations is determined by a comparison of the two coefficients.

Variable. Quantity which assumes in a discussion a series of consecutive values. A general variable passes through all values from zero to infinity. A limited variable passes through

consecutive values intermediate between those fixed by its law of movement. A variable is continuous between two points when all its values between those points are real; it is discontinuous when any of its values between those points become imaginary. Variables are also considered as independent, when considered as primary in the discussion, and dependent, when they are functions of other variables.

Variable Period. Period of adjustment between the instant at which a current of electricity begins to flow into a wire and that at which it becomes steady.

Variables. 1. Winds of certain latitudes. 2. Latitudes where these winds prevail.

Variable Stars. Stars whose light regularly increases to a maximum, then diminishes to a minimum. The period may be from 1 or 2 days to a year, or perhaps in some cases several years.

Variable State. See CONDUCTION.

Variation. Tendency of offspring to differ slightly from the parent forms. Biologists fall into two schools according to their view of the nature of variation. Darwinians believe that the variations are fortuitous, and that natural selection alone determines a definite line of progress. The Lamarckians believe that there is a tendency toward the transmission of definite characters acquired by an organism which is under a strain from imperfect adaptation to its environment. Both schools adopt the evolutionary theory; viz., that species become established through the emphasis of variations in definite and different directions among the offspring of nearly similar ancestors. Darwinians look to outside forces as the sole determinants, Lamarckians to factors internal to the organism.

Variation. In Algebra, increase or decrease of one quantity proportionally to the change in another. Its sign is α. Variation is direct if the two quantities change in the same sense, inverse if in different senses. Direct variation implies a constant quotient, indirect a constant product.—In the Calculus of Variations, arbitrary indeterminate increment added to a primitive function of two or more variables, whence is deduced the variation of the derived function.

Variation. In Botany, slight difference between an individual and the type of its species.

Variation, LUNAR. Inequality in the moon's motion, due to the tangential component of the sun's disturbing action; discovered by Tycho Brahe.

Variation of the Needle. Due to solar influences or to magnetic storms. The daily variation often equals one-quarter of a degree. The secular variation has a period of two or three centuries: its amount is several degrees. The absolute variation from the true meridian is called the declination of the needle.

Variations. Departure in kind or quality or quantity of any phenomenon from an average or normal condition; *e.g.*, magnetic variation is the difference in azimuth between the meridian and magnetic needle. The variations of temperature and pressure from the normal values are now generally called departures. Variations are classified as irregular or accidental, when they follow no known law; periodic or cyclic, when they go through a systematic series of changes, diurnal, annual, or secular, returning to their original value and then repeating themselves; non-periodic or acyclic, when the changes follow some system, but do not repeat themselves after a definite period.

Variations. In Music, transformations by means of embellishments, or other melodic, rhythmic, or harmonic devices, of a fundamental melody called a theme. It was formerly customary to leave the harmony unchanged, but now the greatest latitude is allowed in every particular. The variation form is frequently chosen for slow movements in SONATAS (q.v.) and symphonies.

Varices. Ridges that cross the whorls of the shell of Gastropods.

Varick, THEODORE ROMEYN, M.D., 1825–1887. Practitioner in Jersey City; introducer of improvements in surgery.

Varicose Veins. Condition of enlarged and twisted veins, usually of the lower extremities, due first to some obstacle in the venous circulation whereby the veins become overdistended, then tortuous, and enlarged or knotted, with thinned walls. The walls may eventually give away, causing hemorrhages or varicose ulcers. Persons inflicted with varicose veins should wear an elastic bandage or stocking to support the parts.

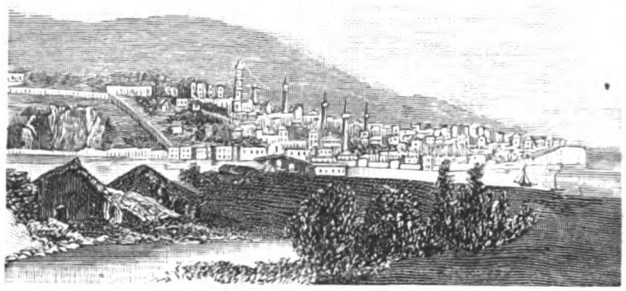
Variegated Copper. BORNITE (q.v.); so called from an iridescent tarnish on the surface.

Variegation in Plants. This is a condition in which other colors are found in parts of which the normal color is green. The chlorophyll is more or less suppressed. It is regarded as a disease, of which the causes are not known. It may be made permanent by proper methods and is compatible with health. It is rarely perpetuated by seed; it can be increased by cuttings, layers, division, budding or grafting. Sometimes the stock causes the cion to revert to the normal state as in budding; sometimes the stock develops variegation in other branches. In the former case the bud should be pruned away. These variegations in color are much used in ornamental gardening.

Variety. Group of plants subordinate to a species, differing from the type by small and inconstant characters.

Variola. See SMALLPOX.

Varna. Town of Bulgaria, on the Black Sea; scene of a Turkish victory over Hungarians Nov. 11, 1444; taken by Russians 1828; occupied by French and British 1854 as the depot for the allied armies fighting against Russia at Sebastopol; strongly fortified till 1878. Pop., 1893, 28,174.



Varna.

Varnhagen, FRANCISCO ADOLPHE DE, 1816–1878. Brazilian historian, of German parentage; Viscount 1874.

Varnhagen von Ense, KARL AUGUST, 1785–1858. German literary biographer of Goethe, 1823, of his wife, Rahel Levin (1771–1833), 1834–36, and others. *Tagebucher*, 14 vols., 1861–71; *Schriften*, 19 vols., 1871–77.

Varnish. Gum resins dissolved in spirit or some other liquid. There are many varieties; copal, mastic, shellac, benzoin, colophony, amber and sandarac are among the gum resins; and alcohol, methyl alcohol, ether, naphtha, linseed oil and sweet oil are among the liquids employed. Various colors are given to varnishes by the use of gamboge, cochineal, annatto, turmeric and other substances. Oil varnishes are the most durable and take the highest polish. Spirit varnishes are not suited for much exposure to the air, but are adapted for cabinet work, maps and toys. If too much spirit is used they crack in drying, and too much oil keeps them from drying.

Varnish Tree. Name given to trees whose resinous juice is used for varnishing. They belong to several distinct natural orders. Among these are the Black Varnish tree of India, and the Japan, New Granada and Sylhet Varnish trees.

Varnum, JAMES MITCHEL, 1748–1789. Col. R. I. troops 1775; Brig.-gen. 1776–79; in Congress 1780–82 and 1786–87; Judge of Northwest Territory 1788.—His brother, JOSEPH BRADLEY, 1750–1821, was M.C. from Mass. 1795–1811, Speaker 1807–11, U. S. Senator 1811–17, and Major-gen. Mass. militia from 1805.

Varoli, COSTANZO, 1543–1575. Prof. Bologna; writer on anatomy.

Varona, ENRIQUE JOSÉ, b.1849. Cuban poet and philosopher. *Logica*, 1880.

Varotari, ALESSANDRO, 1590–1650. Italian painter.

Varro, MARCUS TERENTIUS, 116–27 B.C. Roman writer, celebrated for learning. He took the side of Pompey in the civil wars, but was pardoned by Cæsar. Under the second triumvirate he was proscribed, but escaped. He wrote on a wide range of subjects, as Agriculture, the Latin Language, and Antiquities. Fragments of his *Menippean Satires* and of other treatises survive.

Varro, PUBLIUS TERENTIUS ("ATACINUS"), 82–37 B.C. Latin poet, tr. *Argonautica*.

Varus, PUBLIUS QUINTILIUS, d.9. Consul 13 B.C.; Gov. of Syria 6–4 B.C., of Germany A.D. 6. Marching with 3 legions and auxiliaries through a pass in the Lippische Wald, he was attacked by Arminius, and his army utterly destroyed after 3 days' battle.

Vasa. Surname of Gustavus I., King of Sweden 1523. The male line of the V. dynasty expired with Charles XII. 1682–1718: other branches reigned till 1818. See GUSTAVUS I.

Vasa Aberrentia. Relics of branches from the Wolffian

tubules, posterior to the vasa efferentia in the male. They form the paro-ophoron in the female, which also includes part of the posterior portion of the Wolffian duct, present as the par-epididymis (paradidymis) in the male.

Vasa Efferentia. Branches from the Wolffian tubules that enter the testes to convey the semen to the Wolffian duct; present as rudiments in some female vertebrates. In the male they form the head of the epididymis, the remainder being the coiled Wolffian duct.

Vasarhely, HOD MEZO. Town of e. central Hungary, 20 m. n.e. of Szegedin. It has a good trade and a large cattle-market. Pop., 1890, 55,483.

Vasari, GIORGIO, 1511-1574. Florentine painter of the decadence period, and architect of the Uffizi palace; famous for his history of Italian artists, 1550, tr. 1850, our main

The Six Poets, by Vasari.

original authority. Its value does not lie in its critical accuracy, but in its nearness to the life-time of the men described and substantial fidelity to the facts then known.

Vasco da Gama. See GAMA.

Vasco Nunez. See BALBOA.

Vasconcellos, ANDRES DE. Portuguese seaman who sailed with De Soto 1538 and explored the Florida coast. His narrative appeared in a Spanish version 1545.

Vasconcellos, JOAQUIM ANTONIO FONSECA DE, b. 1849. Prof. Oporto 1883; historian of music and art.—His wife, KAROLINA WILHELMA (MICHAELIS), b.1851 in Berlin, m.1876, is an authority on old Spanish and Portuguese literature.

Vasconcellos, SIMAO DE, 1599-1670. Historian of the Jesuits in Brazil, 1663.

Vascular. Composed of vessels or ducts, either wholly or in part.

Vascular Cryptogams. See PTERIDOPHYTA.

Vascular Cylinder. That of woody tissue in herbaceous stems and young shoots of woody plants.

Vascular Pore. Opening in the anterior and ventral part of the body of nematode worms of the lateral line organs (segmental tubes).

Vascular System. Portions of a plant or one of its organs which are composed of vascular tissue, collectively considered.

Vasculose. Modification of cellulose, not readily soluble in sulphuric acid.

Vasculum. Metallic case used in the field for malling botanical collections.

Vase. Large cup with handles; a kind of urn. Modern vases are solely ornamental. Ancient vases were made of glass, earthenware, metal or stone. See GLASS, ANCIENT.

Vaseline. Lubricant consisting of semi-solid and high boiling hydrocarbons present in petroleum; prepared usually by distilling off the volatile portions in vacuo and filtering the residuum, sometimes by dissolving paraffine in a heavy oil. It does not become rancid on standing.

Vasey, GEORGE, M.D., 1822-1893. Botanist of U. S. Dept. of Agriculture from 1872; writer on grasses.

Vashti. Persian queen, wife of Ahasuerus (supposed to be Xerxes). He divorced her and married Esther, the Jewess.

Vasquez, FRANCISCO, ab.1600-ab.1660. Historian of the conquest of Guatemala 1714-16.

Vasquez de Coronado, FRANCISCO, ab.1500-ab.1543. Explorer of n. Mexico 1540-42.—His relative, JUAN, 1525-1565, was an official and explorer in Central America.

Vassar, MATTHEW, 1792-1868. Brewer of Poughkeepsie, N. Y., founder of V. Coll.—His nephews, MATTHEW, 1809-1881, and JOHN GUY, 1811-1888, were benefactors of it and of other institutions.—Their cousin, JOHN ELLISON, 1813-1878, was noted as a lay evangelist.

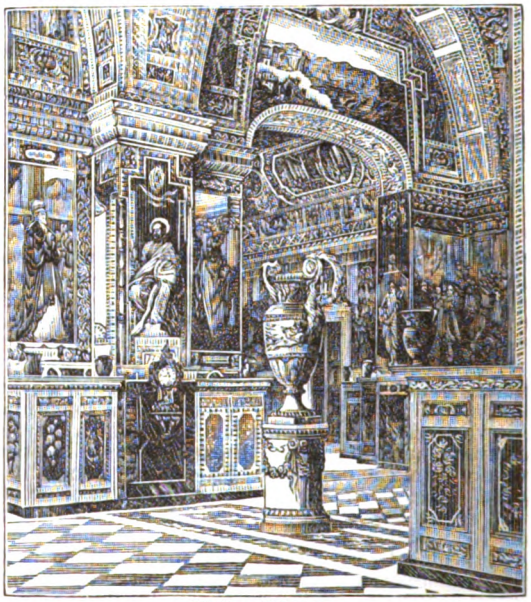
Vassar College. For women; at Poughkeepsie, N. Y.; founded 1861, opened 1865. Its endowment is over $1,100,000, with buildings and collections worth as much. It has an astronomical observatory, with laboratories for the study of chemistry, physics, biology, mineralogy, and geology. It has (1897) 20 professors and 31 assistants of both sexes, 537 students, and a library of 25,000 volumes.

Vater, JOHANN SEVERIN, 1771-1826. Prof. Jena 1796, Halle 1800-9 and from 1820, and Königsberg 1809-20; author of Hebrew and other grammars, and of a commentary on the Pentateuch, 1802-5. *Tables of Ch. History*, 1809, tr. 1831.

Vatican Codex. Uncial manuscript of the Greek Bible in the Vatican Library, dating from the 4th century. Tischendorf considers it one of the 30 copies of the Scriptures which Eusebius had prepared by order of Constantine in 330. It contains the greater part of the O.T. and the new as far as Hebrews ix. 14. The first reproduction of it appeared 1857.

Vatican Council. Dec. 8, 1869-July 18, 1870; reckoned in R. C. Ch. the 21st Œcumenical Council. It defined the doctrinal infallibility and universal episcopate of the Pope, and led to the Old Catholic secession.

Vatican Palace. Usual residence of the popes since 1377; enlarged 1450 and later. It is 1,151 ft. long and 767 ft.



Vatican Library.

wide, contains ab.11,000 rooms, and communicates with St. Peter's, which is the Vatican Basilica. Its collections of books, MSS., statuary, and antiquities are large and valuable.

Vatke, JOHANN KARL WILHELM, 1806-1882. Prof. Berlin from 1837. His *Religion des Alten Test.*, 1835, and other works, were of some importance in the early history of the higher criticism. *Religionsphilosophie*, 1888.

Vatry, MARC ANTOINE BOURDON, BARON DE, 1761-1828. French official and writer; Sec. to De Grasse 1780-82, and then to Vaudreuil; Sec. Navy 1798-1800; Minister to U. S. 1800; in office till 1815.

Vattel, EMMERIC DE, 1714-1767. Swiss jurist, Saxon envoy at Berne 1746-58. His *Law of Nations*, 1758, tr. 1760, had great repute. *Droit naturel*, 1762.

Vattemare, ALEXANDRE, 1796-1864. French ventriloquist, advocate of international exchanges of books, maps, museum specimens, and art objects.

Vauban, SEBASTIEN LE PRESTRE DE, 1633-1707. French military engineer of highest rank. He created or perfected the bastioned system of fortification, invented parallels in sieges and the ricochet fire, conducted 53 sieges, bore part in 140 battles, built 33 fortresses, repaired ab. 100 others, and was made marshal of France 1703. His chief writings were reprinted 1796.

Vaucanson, JACQUES DE, 1709-1782. French inventor of

a player of musical instruments, a weaving ass, and other automatons.

Vaucher, JEAN PIERRE ÉTIENNE, 1763–1841. Prof. Geneva. *Histoire des Conferves*, 1803; *Plantes d'Europe*, 1841.

Vaucluse. Village of s.e. France, 19 m. e. of Avignon; noted for its scenery, and as a residence of Petrarch.

Vaud. Canton of w. Switzerland, held successively by Burgundy, Savoy, and Berne till 1803. Area 1,244 sq. m.; pop., 1894, 256,242, chiefly French Protestants.

Vaudeville. Light comic drama, including songs and dances. See BASSELIN, O.

Vaudois. See WALDENSES.

Vaudreuil, PHILIPPE DE RIGAUD, MARQUIS DE, 1640–1725. French commander in Canada 1687; defender of Quebec 1690 and 1710; Gov. of Montreal 1698, and of Canada from 1703.—His son, PIERRE, 1698–1765, Gov. of La. 1742, and of Canada 1755, was defeated at Quebec 1759, and at Montreal 1760.—His brother, LOUIS PHILIPPE, 1691–1763, served through many campaigns in Europe, and became Lieut.-gen. 1753.—His son, LOUIS PHILIPPE, 1724–1802, held command in American waters 1779–82, won several victories, became Lieut.-gen. 1782, and was in England 1791–1800.

Vaughan, BENJAMIN, M.D., LL.D., 1751–1835. Anglo-American diplomatist. *Calm Observer*, 1793; *Klyogg, or Rural Socrates*, 1806.

Vaughan, CHARLES JOHN, D.D., b.1816. Headmaster of Harrow 1844–59; master of the Temple, London, 1869–94; Dean of Llandaff since 1879; N. T. reviser and commentator.

Vaughan, HENRY, 1621–1695. English poet of Herbert's school. *Silex Scintillans*, 1650–55. His fame is chiefly since the reprint of 1847. *Works*, 4 vols., 1868–71.

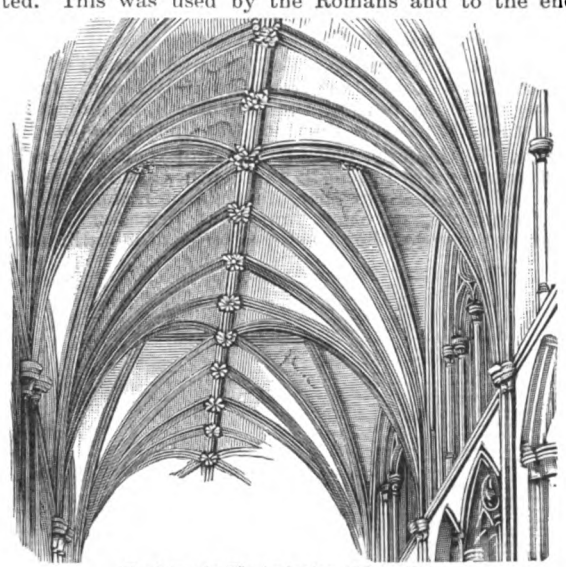
Vaughan, HERBERT, D.D., b.1832. R. C. Bp. of Salford 1872; Abp. of Westminster 1892; Cardinal 1893.

Vaughan, ROBERT, D.D., 1795–1868. Prof. London Univ. 1830–42; pres. Lancashire Coll. 1843–57; founder and ed. *British Quarterly*, 1845–66; prolific writer. *Life of Wycliffe*, 1828–53; *Revolutions in English History*, 1859–63; *Nonconformity*, 1862.

Vaughan, SIR WILLIAM, LL.D., 1577–1640. Welsh settler in Newfoundland ab.1625; poet. *Golden Fleece*, 1626; *Ch. Militant*, 1640.

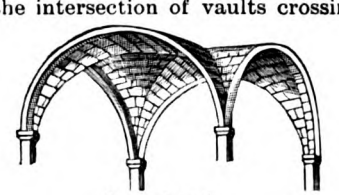
Vaugiraud, PIERRE RENÉ MARIE, COMTE DE, 1741–1819. French naval officer, in America 1780–82; Gov.-gen. of the Antilles 1815–18.

Vault. Continuous arch, which may be cylindrical or pointed. This was used by the Romans and to the end of



Vaulting in Westminster Abbey 1260.

the Norman style. The Romans also used groining, formed by the intersection of vaults crossing at right angles, some-



Groined Arch.

Cylindrical Arch.

times of different widths and heights; they also practiced hemispherical vaulting. The Pantheon is a magnificent example of this, 142 ft. diameter. In the Norman style, cylindrical and groined vaulting are used. In the Early English style, ribs were used, and often the main vault has double the width of the cross-vault. In the Perpendicular style, pendants were used at the junction of ribs.

Vaulting-Shaft. Small column supporting the ribs of a vault; sometimes the shaft rises from the floor, as in the Norman and Early English styles; or from the capital of a pillar or a corbel or other projection, as in the 14th century.

Vauquelin, LOUIS NICOLAS, 1763–1829. French chemist, discoverer of the element chromium 1497, and author of numerous papers.

Vauquelinite. Rare mineral, containing lead, phosphorus and chromium; found in Siberia and, very sparingly, in a few U. S. localities.

Vautier, BENJAMIN, b.1829. Swiss genre painter.

Vauvenargues, LUC DE CLAPIERS, MARQUIS DE, 1715–1747. French moralist. *Connaissance de l'Esprit Humain*, 1746.

Vaux, CALVERT, 1824–1895. Anglo-American landscape architect, designer of many parks and buildings. *Villas and Cottages*, 1860.

Vaux, RICHARD, 1816–1895. Recorder of Phila. 1842–49; inspector of State prison 1843; Mayor 1856; M.C. 1890–91. *Reports of Penitentiary*, 45 vols., 1842–86; *Recorder's Decisions*, 1845.—His father, ROBERTS, 1786–1836, was an eminent lawyer and penologist.

Vaux, THOMAS, LORD, ab.1510–1556. English lyric poet.

Vaux, WILLIAM SANSOM, 1811–1882. American mineralogist and archæologist. His extensive collections were bequeathed to the Phila. Academy of Natural Sciences.

Vauxhall. Place of amusement in Lambeth, London, open 1660–1859.

Veatch, JAMES CLIFFORD, b.1819. Brig.-gen. U. S. Vols. 1862–65, serving chiefly in Tenn., Miss., Ga., and Ala.

Vecellio. See TITIAN.

Vector. Directed line or expression of transference in a given direction. Its symbol is V. The unit vector is usually indicated by a Greek letter, and becomes a finite vector by means of a coefficient called a Tensor. Addition and subtraction of vectors give the result rather than the amount of movement. Multiplication and division of vectors are called geometric, and produce QUATERNIONS (q.v.). Physical quantities involving the element of direction, as velocity, acceleration, force, are vector quantities. Quantities without direction, as time, mass, speed, are called scalar quantities.

Vectorial Angle. That between the initial line and the radius vector in the polar system of co-ordinates.

Vedanta. Most orthodox of the six Brahmanical philosophies.

Vedas. See VEDISM.

Veddahs. Primitive people of e. Ceylon, probaby representing the Yakkos of Sanskrit writers. Their dwellings are

Veddahs.

caves or the forest trees; they clothe themselves with foliage, and they devour uncooked vermin and reptiles. They can

neither read, count, or mark the succession of time, nor distinguish colors, and never laugh. They speak an Aryan language and are fast disappearing.

Vedder, ELIHU, b.1836. Most imaginative and intellectual of American painters; active at Rome; draughtsman of great power; illustrator of Fitzgerald's *Rubaiyat of Omar Khayyam* 1883–84. His *Lair of the Sea Serpent* is in the Boston Museum. N.A. 1863.

Vedel, ANDERS SÖRENSEN, 1542–1616. Danish preacher, tr. Saxo Grammaticus' history.

Vedette. Sentinel, usually mounted, in advance of troops.

Vedism. Primitive religion of the Aryans, named from its sacred books, believed to be inspired by Brahma; viz., *Rig-Veda*, the most ancient, comprising a collection of hymns, *Yajur-Veda*, *Sama-Veda*, and *Atharva-Veda*. There are three great gods in Vedism, Agni, India, and Soma. The generally accepted date of its origin is 1200 B.C. The Vedic Aryans built no temples, nor are idols or divine images of their epoch known.

Veer. Changes of the wind when in the order e., s., w., n., or in the same direction as the apparent diurnal course of the sun to an observer in high n. latitudes, or with the motion of the hands of a watch when held face upward. See HAUL.

Veering, or WEARING. Changing a ship's course from one tack to the other by turning the stern to windward. There

Fig. 1.

are two periods when veering is a perilous operation, when a heavy sea is running; namely, soon after a ship's head has payed broad off, when she is liable to be caught in the trough

Fig. 2.

of the sea as in fig. 1; and when she has come with her head right off the wind, and is scudding, as in fig. 2.

Vega. α-Lyræ; brightest star of the n. heavens, right ascension 18h. 33m., declination 38° 40′, parallax 0″.161.

Vega, GARCILASO (INCA) DE LA, 1539–ab.1620. Son of a Spanish officer and a Peruvian princess; in Europe from 1560. His *Commentarios reales de los Incas*, 1605, and *Hist. Peru*, 1617, are important sources. *Florida del Inca*, 1605, deals with De Soto.

Vega, GEORG, FREIHERR VON, 1756–1802. Austrian officer, writer on mathematics. *Logarithmentafeln*, 1783.

Vega, VENTURA DE LA, 1807–1865. Spanish poet and dramatist, b. in Argentina.

Vega Carpio, FELIX LOPE DE, 1562–1635. Chief founder of Spanish drama, and its most prolific and popular representative; author of some 600 known plays, and, it is supposed, twice as many lost, besides 21 vols. of poems and romances; unsurpassed in fluency and invention. In later life he was a priest. The Spanish Academy is reprinting his plays.

Vegetable. Any plant, especially those of which parts, other than the fruit and seed, are used for food.

Vegetable Alkali. Name given to POTASSIUM CARBONATE (q.v.).

Vegetable Anatomy. Structure of plants.

Vegetable Butter. Name given to vegetable fats, such as cacao, cocoanut, nutmeg, palm and shea. The latter is used as a substitute for butter in Africa.

Vegetable Flannel. Material woven from pine leaves, and supposed to have medicinal properties. It is worn by persons afflicted with rheumatism and pulmonary complaints.

Vegetable Ivory. See IVORY, VEGETABLE.

Vegetable Marrow. *Cucurbita ovifera.* Trailing vine of the Gourd family. Its large fruit is extensively used for food.

Vegetable Pathology. That part of Botany which deals with the diseases of plants and their treatment.

Vegetable Physiology. See PHYSIOLOGY, VEGETABLE.

Vegetable Silk. See PULU.

Vegetable Wax. Protective secretion of the surfaces of many leaves and fruits; on the latter it constitutes the bloom.

Vegetarianism. Practice of abstaining from animal food, and subsisting wholly upon vegetables and cereals; advocated by an English Society, founded 1847.

Vegetation. Plants in general, especially in relation to scenery.

Vegetative Cell. Active somatic cell, as distinguished from a reproductive one.

Vegetative Nucleus. That of a vegetative cell, especially in pollen-tubes.

Vegetative Stage. Period during which bacteria are actively growing and multiplying. It precedes the zoöglœa stage. The corresponding stage for disease germs lasts from the time of infection to the crisis of the disease. Bacteria in the vegetative condition are easily stained. See SPORES OF BACTERIA.

Vegetius, FLAVIUS RENATUS, ab.400. Writer or compiler of a work on military science, long highly valued.

Vehmgerichte. Tribunals of the Middle Ages, especially in the 14th and 15th centuries in Westphalia, with sittings usually secret. Accused persons, unable to prove their innocence before the open court, were brought before a secret tribunal, as also those guilty of sorcery, rape, theft, robbery, or murder. The Freischöffen executed sentence by putting the condemned person to death wherever met, leaving a knife near the corpse as a sign of the Vehmgerichte.

Vehse, KARL EDUARD, 1802–1870. German historian. *Shakespeare*, 1851; *Der Deutschen Höfe*, 1851–58.

Veigl, FRANZ XAVIER, 1723–1798. Austrian Jesuit, in S. America 1753–77; writer on the missions there.

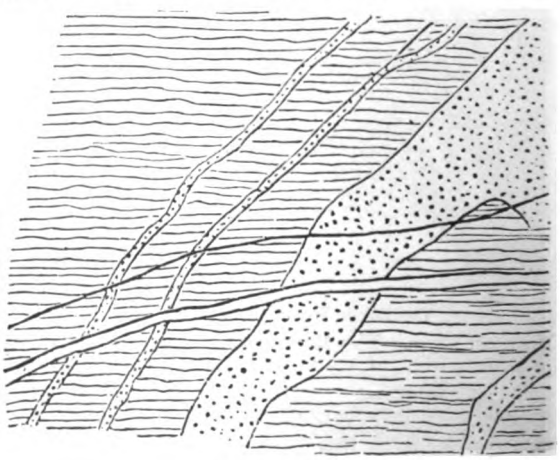
Veii. Etrurian city, long at war with Rome, till subdued by Camillus 396 B.C.

Veil. Membrane which in early stages of growth protects the spore-bearing surfaces in mushrooms. It extends from the stem to the margin of the pileus.

Veiled Prophet. See MOKANNA.

Veil of the Temple. Embroidered curtain which separated the Most Holy Place from the Holy Place. Luke xxiii. 45 describes it as rent at the Crucifixion, as indicating that the way into the Divine Presence was then laid open.

Vein. In Geology, plate or sheet of rock, relatively thin, but of great extent in length and depth, that intersects other rocks and differs from them in time of formation, in character, structure, or other important respects. Frequently, though not always, they are repositories of metalliferous ores;



Granite Veins.

most ores and many crystalline minerals occur thus; hence they have especial interest for the miner and the student of economic geology. In some cases a vein is doubtless the filling of a previously existing fissure; in other cases a tabular band or zone of rock appears to have furnished an easier

channel for passage of mineralizing solutions than the inclosing walls, and thus given rise to vein phenomena. No simple classification of veins yet proposed has met universal adoption.

Veinlets. Minute subdivisions of the veins of a leaf.

Veins. Circulatory apparatus which receives the blood from the capillaries and returns it to the heart. Hæmorrhage from a vein is constant, not in jets, and of dark blood. Should the cut be a large one and an effort be made to stop its flow by pressure, the cut should be between the bandage and the heart.

Veins. In Botany, bundles of woody tissue which traverse leaves in various ways, serving as conducting channels for the distribution of sap; also known as Ribs and Nerves.

Veintemilla, IGNACIO, b.1830. Ecuadorian general, leader of a revolution 1876; pres. or dictator 1878–83; since in exile.

Veit, PHILIPP, 1793–1877. Prussian painter, chiefly of allegorical and religious subjects; stepson of F. Schlegel; director Art Institute at Frankfort 1830–43.

Veitch, JOHN, 1829–1894. Prof. St. Andrews 1860, Glasgow 1864; editor and biographer of Sir W. Hamilton. *History and Poetry of the Scottish Border*, 1877.

Veitch, WILLIAM, LL.D., 1794–1885. Scottish scholar and critic; contributor to Liddell and Scott's *Lexicon* and many other works.

Vela, VINCENZO, 1822–1891. Swiss-Italian sculptor.

Velamen. Layers of cells, filled with air, which invest the tips of ærial roots of orchids, etc.

Velarium. Velum-like fringe on the edge of the umbrella of the *Charybdeidæ* (Jelly-fish); differing from a true velum in containing prolongations of the gastro-vascular spaces.

Velasco, JOSÉ MIGUEL DE, 1790–1859. Acting Pres. of Bolivia 1829–30; Pres. 1839–41 and 1847–48.

Velasco, JUAN DE, 1727–1819. Prof. Lima, expelled with the Jesuits, and resident in Italy. *Hist. Quito*, 1841–44.

Velasco, LUIS DE, COUNT OF SANTIAGO, ab.1500–1564. Viceroy of Mexico from 1550.—His son, LUIS, MARQUIS OF SALINAS, 1535–1614, was Viceroy of Mexico 1590–95 and 1607–11, and of Peru 1596–1604.

Velasco, LUIS VICENTE, ab.1710–1762. Spanish officer, slain in defending Havana against the British.

Velasquez, DIEGO DE, ab.1460–ab.1532. Spanish adventurer, in Hispaniola 1493; conqueror and Gov. of Cuba 1511. He promoted or ordered the expeditions of Cordova, Grijalva, and Cortes, 1517–18, and sent Narvaez against Cortes 1520.

Velasquez, DIEGO RODRIGUEZ DE SILVA Y, 1599–1660. Greatest Spanish painter, having no superior in his age;

Herzog Olivarez, by Velasquez.

only Rembrandt may be considered his equal. His *Æsop*, *Menippus*, *Surrender of Breda*, and many other works, are in the Madrid Gallery: fine portraits of his are in most European collections.

Velasquez de la Cadena, MARIANO, 1778–1860. Mexican official, in New York from 1810; prof. Columbia from 1830; author of Spanish text-books and a *Dictionary*, 1852.

Velde, ADRIAAN and WILLEM VAN DE. See VAN DE VELDE.

Veldeke, HEINRICH VON, 12th cent. German epic and lyric poet.

Veleda, 1st cent. German prophetess, carried a prisoner to Rome.

Veleia. Italian city, 20 m. s. of Piacenza; buried ab.280; excavated 1860–65.

Velella. See DISCOIDEÆ.

Veley, VICTOR HERBERT, F.R.S., b.1856. English chemist.

Velez-Herrera, RAMON, 1808–1887. Cuban poet and dramatist.

Veliger. Larvæ of Mollusks; generally provided with a velum.

Velius Longus, ab.110. Commentator on the *Æneid*. His *De Orthographia* is extant.

Velleius Paterculus. See PATERCULUS.

Velletri. Ancient Volscian town, 25 m. s.e. of Rome. Pop. ab. 14,000.

Vellore. Town of s. India, 80 m. w. of Madras. Its fort was held against Hyder Ali 1780–82. Pop., 1891, 44,925.

Velloso, JOSÉ MARIANNO DA CONCEIÇAO, 1743–1812. Brazilian botanist. *Alographia dos alkalis fixos vegetal on potassa*, 1798; *Quinografia Portugueza*, 1799; *Floræ fluminensis*, 11 vols., 1790–1825.

Vellum. See PARCHMENT.

Velo. Unit of velocity; equal to the velocity of a point which, moving uniformly, passes over one foot in one second; name proposed by Lock.

Velocimeter. Any apparatus for determining the velocity of a movement. Ordinary anemometers and water gauges measure the total movement in a given time, but the velocimeter proper shows the velocity at any moment.

Velocimeter. Apparatus designed to measure the average velocity of projectiles between any two points; especially used to test gunpowders, and ascertain the pressures in the bore of a gun due to the explosion of the charge. The most recent and by far the most accurate is the new polarizing photo-chronograph, designed by Prof. Crehore of Dartmouth Coll. and Lieut. Squier, U.S.A., which has been tested recently at Fort Monroe with most satisfactory results.

Velocipede. Originally a BICYCLE (q.v.), which the rider propelled by striking the ground with his feet; now called unicycle, bicycle or tricycle, according to the number of wheels.

Velocity. Space passed over in a unit of time (see ANGULAR VELOCITY). In English and French writings it is denoted by v. The scientific time unit is the second. It is always found by dividing the space passed over by the time consumed in such passage $\left(\frac{s}{t}\right)$.

Velocity, COEFFICIENT OF. Ratio of the actual to the theoretic velocity in flow of water. For an orifice in a thin plate its value is 0.98, for a short tube 0.82. The square of the coefficient of velocity gives the ratio of the effective head to the theoretic head.

Velocity Head. Height through which a body must fall to acquire a given velocity. If h be the velocity head in ft. and v the velocity in ft. per sec., then $h=0.0155v^2$. Thus, a velocity of 10 ft. per sec. will be produced by a fall through about $1\frac{1}{2}$ ft.

Velocity of Approach. Mean velocity of a stream above a weir or dam. The head due to this is added to the head on the crest as the total effective head causing the flow.

Velocity of the Wind. Speed of horizontal motion of the air, measured in miles per hour in the English system, but in meters per second in the Metric system. 1 mile per hour= $\frac{1}{2}$ meter per second.

Veloudakes, COSTA, b.1802. Cretan patriot, commander-in-chief of revolutionary forces in 1878.

Velum. 1. Ciliated lobes borne by larval Gastropods and

other mollusks, which become the buccal lobes of the adult. 2. Diaphragm-like membrane attached to the edge of the umbrella in jelly-fish and closing in the subumbrellar cavity; perforated in the center by the codonostome. 3. Indusium in *Isoetes* or the veil of mushrooms.

Velvet. Silk fabric having the ordinary warp and weft as in plain weaving, or as in twills, and also additional warp threads which are woven into the ground of the cloth and passed over wires on the surface. These threads are cut by a knife before removing the wire, producing a cut pile; this is then singed or sheared, producing a surface like fur. When the looped threads are not cut, it is called uncut velvet. Velveteen is a mixture of silk and cotton. Fustian is all cotton. Figured velvets are also made. It is considered to have originated in Italy or Sicily ab.1150. They are largely made in Crefeld, Prussia, and Lyons.

Velvet-Leaf. *Abutilon abutilon.* Coarse, densely tomentose herb of the Mallow family, native of India, introduced into N. America; known as Indian Mallow and American Jute.

Venable, CHARLES SCOTT, LL.D., b.1827. Prof. Univ. Va. since 1865; writer on mathematics.—His uncle, ABRAHAM, 1760–1811, was M.C. from Va. 1791–99 and U. S. Senator 1803–4.

Venables, EDMUND, 1819–1895. Canon of Lincoln, Eng., 1867; archæologist; contributor to religious cyclopedias.

Vena Contracta. See CONTRACTED VEIN.

Venæ Advehentes. 1. Veins that leave the ductus venosus where it enters the liver to ramify the tissues of this organ. 2. Posterior cardinals in reptiles when they pass to the kidneys, and there break up into capillaries, forming a renal-portal system.

Venæ Revehentes. Veins that collect the blood from the liver into the ductus venosus.

Venant, JEAN BARRÉ DE, 1737–1810. French writer on agriculture, long in San Domingo.

Venantius. See FORTUNATUS.

Venation. Arrangement of fibrovascular bundles in a leaf or other organ.

Vendee, LA, WAR OF. Royalists of w. France rose against the Republicans Aug. 1792, and defeated them at Saumur June 10, 1793, but were worsted at Le Mans Dec. 12, 1793. Brittany also was involved in the struggle, which lasted till 1796.

Vendemiaire. First month of the French revolutionary calendar, beginning (in 1793) Sept. 22 and ending Oct. 21.

Vender's Lien. That of the unpaid seller of land or chattels. In case of land it is avoidable against any one but a purchaser for value without notice: in case of chattels it entitles the vender to retain the goods until payment, where the sale is for cash, or the term of credit has expired, or the buyer is insolvent.

Vendetta. Form of blood-feud, by which the next of kin, and in a less degree all relatives of a murdered man, are bound to take vengeance on the murderer. If he escape, some blood-relation of his may pay the penalty. In Corsica 7,000 murders are said to have occurred 1770–1800 owing to this custom, which prevails also, though to less extent, in Sicily, Sardinia, and Calabria.

Vendôme, LOUIS JOSEPH, DUC DE, 1654–1712. French general, commanding in Spain 1695, and in Italy 1702; defeated by Marlborough at Oudenarde 1708, and retired; recalled to Spain 1710, where he defeated English and Austrian armies, and restored the king, ending the war.

Venedey, JACOB, 1805–1871. German liberal, in France 1832–48. *Römerthum*, 1840; *Irland*, 1844; *England*, 1845; *Des Deutschen Volks*, 4 vols., 1854–62.

Veneer. Thin layer of ornamental wood glued upon some common variety.

Venegas, FRANCISCO JAVIER DE, ab.1760–ab.1820. Viceroy of Mexico 1810–13.

Venegas, MIGUEL, 1680–1764. Mexican Jesuit. *Hist. California*, 1757, tr. 1759.

Venema, HERMANN, 1697–1787. Prof. Francker (Frisia). *Institutes of Theology*, tr. 1850.

Venerable. Title of an Anglican Archdeacon; in R. C. Ch., sometimes given to a departed saint as preliminary to beatification.

Venereal Ulcer. See CHANCROID.

Veneridæ (ROUND CLAMS). Family of Lamellibranchs, including forms having the shell round or oblong, with three cardinal hinge-teeth on each valve. There is a pallial sinus; the siphons are of unequal size and are fused at their base, leaving a long ventral slit for the foot to pass through. *Venus mercenaria*, the quahaug, is abundant all along the N. J. coast. The principal fishing grounds are at Keyport and Tuckerton; the latter exports ab. $100,000 worth annually, over 20,000,000 clams.

Venesection. See PHLEBOTOMY and BLOOD-LETTING.

Veneti. People living near the mouths of the Po, many of whom in the 5th century took refuge from the Huns in the islands where now is Venice.

Venetian Carpet. One of the poorest grades of carpet made. It is composed of woolen warp and coarse hemp filling, and is mostly used as a stair-covering.

Venetian Chalk. FRENCH CHALK (q.v.) used in cosmetics and in making pastels.

Venetian Style. That style of modern ITALIAN ARCHITECTURE (q.v.) formed by architects of the Venetian states from the 15th to the early part of the 17th centuries.

Veneziano. Venetian for PIOMBO (q.v.).

Venezuela. Republic of n. S. America. Its area is 439,120 sq. m. The w. part is crossed by a spur from the Andes, which rises to a great elevation. Most of the remaining part consists of vast treeless plains, known as llanos, a desert in the dry season, but covered with verdure after the annual rains. Cattle-raising, cultivation of cotton, coffee, and sugar-cane are the principal industries. The capital is Caracas. The coast was visited by Columbus 1498, and V. became the seat of some of the oldest settlements in the New World: the chief were made under the auspices of a Spanish company formed for the cultivation of indigo and cacao. A revolution occurred 1810. A republican union was first formed with Ecuador and Colombia, which was dissolved 1830. The republic was engaged in a series of civil wars 1846–70, between the Unionists, who favored a strong central government, and the Federalists, who aimed at the independence of the several States. Quiet was at last restored under Blanco, who was practically dictator until in 1873 he was elected constitutional president. The emancipation of slaves took place 1854. Pop., 1891, 2,323,520.

Traveling in Venezuela.

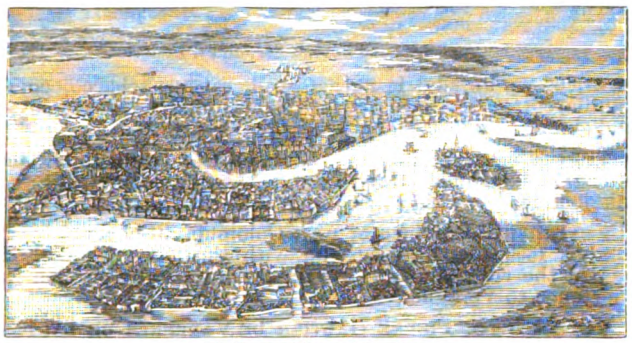
Venezuela, or **Maracaibo,** GULF OF. Inlet from Caribbean Sea, in n.w. Venezuela.

Venezuelan Boundary. The long dispute over the boundary line between V. and British Guiana was raised to a serious international question by Pres. Cleveland's message to Congress Dec. 17, 1895, in which he gave what was regarded by some as a novel interpretation of the Monroe Doctrine. A commission, of which Justice Brewer of the Supreme Court was chairman, was appointed to investigate the subject, and $100,000 appropriated. Lord Salisbury announced Nov. 9, 1896, that England had agreed to submit the matter to arbitration.

The arbiters appointed on the part of the U. S. were Chief-justice Fuller and Justice Brewer of the U. S. Supreme Court; Baron Herschell (ex-Lord Chancellor) and Justice Collins of the Privy Council, on the part of Great Britain; and a fifth to be named by these four, or, in case of failure to agree, by the King of Sweden. V. claimed territory e. of long. 60° W., from the Orinoko River to the Cuyani-Essequibo.

Venial Sin. In R. C. Theology, one which impairs but does not extinguish baptismal grace, and may therefore render the transgressor liable to purgatory, but not to hell.

Venice. City of n. Italy, at the head of the Adriatic Sea, on a salt lagoon. It is built mainly on piles, on a group of small islands, where canals take the place of streets and gondolas that of wheeled vehicles. The region was settled 452 by refugees fleeing before Attila: they lived by fishing and salt-making. The first form of government was republican. As the city grew, factions increased. To remedy this, a Doge was elected 697. V. was nominally subject to the Greek empire.



Bird's-eye View of Venice.

It joined the emperor against the Franks 808, and was invaded 809 by Pepin, whose ships were stranded and taken. In 829 the body of St. Mark is said to have been brought to V.; crowds of pilgrims were thus attracted, and St. Mark was adopted as patron saint. Commercial relations were enlarged through the crusades. A great fire, 1106, led to the use of stone or marble in building. Johannes Comnenus having expelled the Venetians from his territories, they launched a fleet 1123, captured Rhodes, and sacked the Greek islands. In 1177, they defeated the Ghibellines, in defense of Pope Alexander III., who gave the Doge Ziani a ring, with which he bade him wed the Adriatic. The 4th crusade, which set out from V. 1202, having overthrown the Byzantine empire, the best of the territory acquired fell to V.; a fourth part of Constantinople was assigned as the Venetian quarter. Wealth and magnificence increased; art was cultivated; Venetian noblemen were the most polished in Europe. War with Genoa lasted 1256–80. The Council of 10 was formed 1310. A pestilence, 1348, reduced the population. The conspiracy of the Doge Marino Faliero led to his execution 1355. V. lost the carrying trade of the world after the discovery of Cape of Good Hope. The government became a reign of terror; the high character of her citizens departed. In 1797 Napoleon ceded the province to Austria by the treaty of Campo Formio. It was annexed to Italy 1806 by the treaty of Presburg; transferred to Austria 1814, and incorporated with kingdom of Italy 1866. V. has considerable commerce in hemp, cotton, silk, grain, oil, wine and petroleum. In the 15th century the trade was large. The manufactures are lace, silk, velvet, glass, mosaics, artificial pearls and flowers, jewelry and furniture, and shipbuilding. Pop., 1893, ab.151,000.

Venice, PEACE OF. 1177; between Frederick I. and Pope Alexander III.

Veni Creator Spiritus. One of the greatest of Latin hymns; variously ascribed, on inadequate evidence, to St. Ambrose, Gregory I., Charlemagne, Rabanus and Maurus; used in the Breviary for ordinations, and in English or other versions since ab.1520 by all Protestants.

Venire. Common law writ by which the sheriff was authorized to enforce the attendance of jurors upon a session of court.

Veni Sancte Spiritus. One of the sweetest of Latin hymns; usually ascribed, without reason, to Robert II. of France, and by S. W. Duffield to Herrmannus Contractus. It dates from ab.1200, and is in general use through English versions.

Venius, OTHO. See VAN VEEN.

Venn, HENRY, 1724–1797. Anglican Evangelical leader. His *Complete Duty of Man*, 1763, was long popular.

Venn, JOHN, F.R.S., b.1834. English writer on logic.

Vennor, HENRY GEORGE, 1840–1884. Canadian scientist, engaged on surveys 1865–81. *Our Birds of Prey*, 1875; *Almanac*, 1876–84; *Weather Bulletin*, 1882–83.

Venom. Secretion of certain reptiles and insects which proves poisonous when injected into the system by their bite or sting. See BITES and SOLENOGLYPHA.

Venomous Bites. See BITES and SOLENOGLYPHA.

Venous Blood. One of the uses of the blood is to convey oxygen from the air to the various tissues, where it assists in the performance of the vital activities, forming carbonic acid as one of the products. The conveying of the oxygen from the lungs to the part and of carbonic acid back to the lungs is performed by a substance of definite chemical composition, hemaglobin, found in the red corpuscles of the blood. When charged with oxygen it is known as oxyhemaglobin, is of a bright red color, and is carried by the arteries. The blood is distributed to the various parts of the body, the oxygen is given up and the carbonic acid is absorbed; the hemaglobin is then known as reduced hemaglobin, giving a darker red color to the blood, which is taken up by the veins to be conveyed to the heart, constituting venous blood.

Ventadour, HENRI DE LEVIS LA VOUTÉ, DUC DE, 1595–1651. Third Viceroy of Canada, 1625–27, which he administered from France, and endeavored to colonize with Jesuits, neglecting material interests.

Ventenat, ETIENNE PIERRE, 1757–1808. Librarian of the Pantheon in Paris. *Tableau du règne végétal*, 1794; *Principes de botanique*, 1795.

Ventilation. Combined operations of removing foul or vitiated air, and replacing it by fresh pure air. In buildings it is usually combined with heating. It may be natural, depending on differences of weight of two columns of equal height, one of impure and the other of pure air, which are of different temperatures; or it may be mechanical, using machines to displace the air. Mechanical ventilation may be by two systems, one exhausting foul air, depending on atmospheric pressure to supply the pure, the other, forcing in fresh air, which is expected to drive out the foul. These are known as the vacuum and plenum systems: both combined give the best results. Fan blowers are the most usual machines for this purpose (see BLOWER and FAN). Coils of steam pipes can be used to heat outlet flues and stimulate outflow. Each person requires 1,000 cubic ft. of air per hour, and should be furnished with from 3,000 to 3,600.

Ventimiglia. Fortified town of the Italian Riviera, near the French frontier, 3 m. from San Remo. Its cathedral, in

Ventimiglia.

the Gothic style, stands on the site of a temple of Juno. By the sea are nine grottoes, with prehistoric human remains. Pop. 5,000.

Ventral. Relating to the belly or lower surface of an animal.

Ventral Plate. Thickened portion of the blastoderm of insects, destined to form the belly part of the larva.

Ventral Segment. See LOOP.

Ventral Suture. Line of union of the margins of a carpellary leaf.

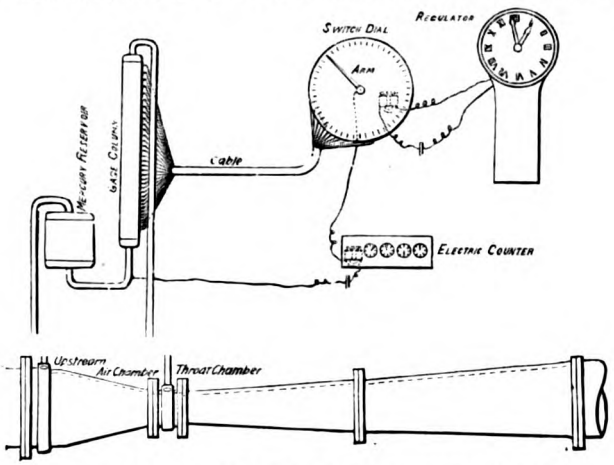
Ventricles. In Anatomy, the word is applied to certain cavities to be found in various organs, the most prominent being the ventricles of the heart and of the brain. The mammalian heart has four cavities: two auricles, receiving the blood from the veins, from which it flows into the other cavities, the ventricles, whence it is forced by the right ventricle through the pulmonary artery to the lungs, by the left through the general arterial system of the body.

Ventriloquism. Art of emitting sounds so that hearers are deceived as to their source and locality; dependent on the method of breathing, and not, as formerly supposed, on the abdomen; known from antiquity, and employed by prestidigitators.

Ventura de Raulica, GIOACCHINO, 1792–1861. Sicilian priest, noted for eloquence and liberalism; general of Theatines; in Rome 1824–49, in Paris from 1851; prolific writer.

Venturi, LUIGI, 1812–1890. Italian critic, poet, and compiler. *Michelangelo*, 1875; *Manzoni*, 1876.

Venturi Tube. One having its diameter contracted for a short distance in order to increase the flow of water. By



Venturi Water Meter and Recording Gauge and Connections.

measuring the pressures at the normal and at the contracted part, the quantity of water passing through can be determined, as in the venturi meter.

Venue. County in which a legal proceeding is to be conducted.

Venus. Roman goddess of spring, and from ab. 217 B.C. of love, being identified with APHRODITE (q.v.).

Venus. Second planet in order of distance from the sun, 67,200,000 m.; diameter, 7,700 m.; density, 4.85 that of water; mass, 0.78 that of the earth; period of revolution about the sun, 224.7 days; time of axial rotation, 23h. 21m. 23s. perhaps. Schiaparrelli concludes from recent observations that the time of axial rotation is the same as the period about the sun, 224.7 days. At greatest elongation its angular distance from the sun may be as great as 47° 45′. Next to the sun and moon, it is the most brilliant object in the heavens, and may frequently be seen in full daylight. Viewed through a telescope it presents phases like the moon and Mercury: there is an extensive atmosphere, but the markings seen on the surface are the faintest and vaguest possible; probably they are only clouds in the planet's atmosphere. Observers have at different times believed that they saw a satellite, but it is certain that none, corresponding to any of the descriptions, exists.

Venusberg. See TANNHAUSER.

Venus' Flower-basket. See HYALOSPONGIA.

Venus' Fly-trap. *Dionæa muscipula.* Insectivorous herb of the natural family *Droseraceæ*, native of e. N. Carolina. Its leaves are irritable, closing quickly and firmly when an insect or other object alights on them. See INSECTIVOROUS PLANTS.

Venus' Girdle. See CESTIDÆ.

Venus' Hair Stone. Dark quartz containing fine acicular or capillary crystals of rutile.

Venus' Looking-glass. Blue-flowered herbs of the genus *Legonzia*, natural family *Campanulaceæ*, natives of N. America.

Vera, AUGUSTO, 1813–1885. Teacher of philosophy in France 1838–51: in England 1851–60; prof. Naples from 1862; tr. Hegel; prolific writer. *Experimental Science*, 1856; *Speculative Logic*, 1875.

Veracity. Disposition and habit of telling the truth under all circumstances.

Vera Cruz. Chief seaport of Mexico on the Gulf of Mexico; founded 1580, in place of one built by Cortes 1520; opposite the fortified islet of San Juan d'Ulloa; taken by the French 1838, and by Gen. Scott 1847. It is extremely unhealthy, and has a poor harbor, but a large trade in coffee, ore, tobacco and leather. Pop., 1895, ab. 30,000.—The State of V. C. has an area

Vera Cruz and Fort of St. John d'Ulloa.

of 27,454 sq. m., and is agricultural, raising tobacco, coffee, vanilla, cotton and hard woods. It has manufactures of cotton and cigars. Pop., 1893, ab. 642,000.

Vera Cruz, ALONSO DE LA, 1504–1584. Augustinian provincial 1550; founder Univ. Mexico 1551; founder of Tarascan missions 1573.

Veragua. Province of n.w. Colombia, discovered by Columbus 1503, and granted him with the title of duke. He named the river which he ascended Verdes-Aguas, which was shortened to Veragua.

Verandrye, PIERRE GAUTIER DE VARENNES DE LA, 1685–1749. Canadian explorer, discoverer of the Rocky Mountains ab.1735.

Veratria. See VERATRINE.

Veratrine. $C_{32}H_{49}NO_9$. Alkaloid obtained from the white hellebore, and other species of *Veratrum;* greenish-white crystalline powder, inodorous, acrid and poisonous, and irritating to the tongue and nostrils. It is used externally in neuralgia.

Verazzano, or **Verrazano,** GIOVANNI DA, ab.1480–ab. 1527. Italian seaman and French privateer, who took a treasure-ship of Cortes 1523; sailed from Madeira Jan. 1524, explored the coast of N. America from Cape Fear to Nova Scotia, and returned to Dieppe in July, claiming to have discovered 700 leagues of coast; executed as a pirate in Spain.

Verb. See PARTS OF SPEECH.

Verbal Orders. Orders given by word of mouth in times of emergency by an officer and transmitted through the recognized military channels have the authority of written orders. It is, however, fully recognized that orders are to be communicated in writing should they be asked for and time permit.

Verbeck, GUIDO FRIDOLIN, D.D., b.1830. Dutch-American missionary and teacher in Japan since 1859; long in government employ; N. T. reviser. He tr. the *Code Napoleon* and other works into Japanese.

Verbeck, REINIER DIRK, b. 1841. Dutch engineer, long in E. Indies.

Verbena, or VERVAIN. Genus of herbs of the natural family *Verbenaceæ*, of wide geographical distribution. Many of the species bear showy flowers, and are cultivated for ornament.

Verbenaceæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Gamopetalæ*, comprising ab.65 genera and 740 species, widely distributed throughout the warm regions of both hemispheres; called the Vervain family.

Verboeckhoven, EUGENE JOSEPH, 1799–1881. Flemish painter, especially of sheep.

Verbena (*Verbena officinalis*).

Vercelli (anc. VERCELLÆ). Town of n. Italy, 40 m. s.w. of Milan; Piedmont: scene of a Roman defeat by Hannibal 218 B.C., and of Marius' victory over the Cimbri 101 B.C.; taken by Spaniards 1630, by French 1704, and by French and Allies 1706. Its cathedral library includes an early Latin MS. of the Gospels, and one of Anglo-Saxon homilies and poems, discov-

ered 1823 and pub. 1836. It has the beautiful basilica of St. Andrew in Romanesque-Lombard style (13th and 14th centuries). Much rice is produced in the vicinity. Pop. ab. 25,000.

Vercingetorix. Commander of the Gauls 52 B.C.; defeated at Alesia 52, led in triumph by Cæsar 45, and slain in prison.

Gold Coin of Vercingetorix.

Verd-Antique. Clouded marble, pale green or mixture of green and white, the green parts generally being serpentine and the white either calcite or dolomite.

Verde, CAPE. See CAPE VERDE.

Verdet's Constant. Amount of rotation of the plane of polarization of a beam of polarized radiation, expressed in circular measure, which takes place between two points in a magnetic field one centimeter apart, within the medium, when the magnetic potential difference between these points is unity. The value of this constant in absolute measure has been determined by Gordon 1877, and by Rayleigh 1885.

Verdet's Law. As a result of his investigations on magneto-electric rotation, Verdet found that "for a given medium and a given wave-length the rotation of the plane of polarization between two points taken in the path of the beam is proportional to the difference of magnetic potential at those points." This is known as Verdet's law. For different media the angular rotation σ is numerically equal to the increase of magnetic potential in the medium $V_A—V_B$, multiplied by a coefficient ω, which is generally positive in diamagnetic media (see VERDET'S CONSTANT). Thus $\omega=\sigma/V_A—V_B$. Rayleigh, using sodium light with CS_2 at 18°, obtained 1.22231×10^{-6} radian for ω.

Verdi, GIUSEPPE, b.1813. Italian opera composer, one of the foremost musical geniuses of the century. He brought out his first opera, *Oberto, conte di S. Bonifacio*, 1839, and his latest, *Falstaff*, 1893. Between these are no less than 24 operas, of which the following still hold their places on the stage: *Ernani*, 1844, *Rigoletto*, 1851, *Il Trovatore*, 1853, *La Traviata*, 1853, *Aida*, 1871, and *Otello*, 1887. He also composed a *Requiem* mass to the memory of Manzoni, 1874, a string quartet, 1873, a hymn for the Universal Exhibition of London, 1862, a *Pater Noster* for five-part chorus, and some songs.

Verdict. Finding of a jury on an issue of fact. If it is a decision of the whole for or against either party, it is general; if a decision of particular questions involved, special.

Verdigris. $Cu:C_2H_3O_2,OH,2\frac{1}{2}H_2O$. Basic acetate of copper, of somewhat varying composition; produced by immersing copper in a dilute acetic acid. See ACETATE OF COPPER.

Verditer. Name for a variety of blue and green pigments; hydrated percarbonates of copper, prepared by adding chalk or lime to a solution of nitrate of copper. Green verditers are made by boiling the blue pigment. Bremen Blue, Bremen Green, Brunswick Green, etc., are some of the names by which the different green and blue verditers are known.

Verdon, SIR GEORGE FREDERIC, F.R.S., b.1834. Anglo-Australian official.

Verdugo, VICENTE, ab.1690–1775. Peruvian historian.

Verdun. Town of n.e. France, 35 m. w. of Metz; annexed to the empire ab.939; surrendered to France 1552; taken and

Verdun.

held by Prussians 43 days, Sept.-Oct. 1792; surrendered to the Germans Nov. 8, 1870, with 4,000 men; held by them till Sept. 16, 1873. Pop., 1891, 18,195.

Verdun, TREATY OF, 843. Three sons of Louis the Pious divided among themselves the Carlovingian empire.

Vere, AUBREY THOMAS DE, b.1814. Irish R. C. poet, noted for grace and delicacy. *Waldenses*, 1842; *May Carols*, 1857; *Essays*, 1887–89.—His father, SIR AUBREY, 1788–1846, pub. *A Song of Faith*, 1842, and other poems.

Vere, EDWARD, 17th EARL OF OXFORD, ab.1540–1604. Courtier and poet; Lord High Chamberlain ab.1585.—His cousin, SIR FRANCIS, ab.1560–1609, served with distinction in the Netherlands, was knighted 1588, and wrote an account of his campaigns, pub. 1657.—His brother, HORATIO, 1565–1635, held command in Holland and Germany, was knighted 1596, and became Baron Vere 1625.

Vere, MAXIMILIAN SCHELE DE, b.1820 in Sweden. Prof. Univ. Va. 1844–61 and since 1866; prolific writer, chiefly on language.

Verestchagin, VASILI, b.1842. Russian painter, chiefly of battle scenes; notable for the size and force of his pictures, the subjects often being painful and horrible.

Verga, GIOVANNI, b.1840. Sicilian novelist, in his later works a strong realist, depicting peasant life. *La Vita dei Campi*, 1880; *House by the Medlar Tree*, tr. 1890.

Verge-Board. See BARGE-BOARD.

Vergennes, CHARLES GRAVIER, COMTE DE, 1717–1787. French Ambassador to Turkey 1754–68, and to Sweden 1771–74; Foreign Minister 1774; promoter of the alliance with the U. S. 1778; negotiator of several treaties.

Vergil. See VIRGIL.

Vergil, POLYDORE, ab.1470–1555. Italian priest, in England 1501–50; prebendary of St. Paul's from 1513; friend of Erasmus and foe of Wolsey. *Proverbiorum Libellus*, 1498. His *De Rerum Inventoribus*, 1499, was much read in four languages: his *Historiæ Anglicæ Libri XXVI.*, 1534, is still valued.

Vergniaud, PIERRE VICTURNIEN, 1753–1793. French deputy 1791; Girondist leader; brilliant orator; executed by the Jacobins.

Verhas, JAN, b.1834. Belgian painter.

Verification. Confirmation by oath of a statement, particularly of a pleading.

Verjuice. Expressed juice of unripe grapes or of wild crab-apples, used in cooking and as an astringent.

Verkolie, JAN. 1650–1693. Dutch painter, chiefly of portraits.—His son, NICHOLAS, 1673–1746, was a historical painter and engraver.

Verlaine, PAUL, 1844–1896. French poet, of unquestioned genius and unregulated life, whose 13 vols. of verse and 6 of prose strangely alternate between debauchery and devotion. *Poèmes saturniens*, 1865; *Sagesse*, 1881; *Romances sans Paroles*, 1887; *Amour*, 1888; *Confessions*, 1895.

Vermejo. Branch of the Paraguay, rising in s. Bolivia and flowing s.e. ab.820 m.

Vermes. Bilateral, elongated animals, without segmented appendages; the body is often made up of a succession of nearly similar rings, segments, joints, articulations, or metameres. A dermal muscular system and paired nephridia are present. The Earthworm is a typical example. It has a digestive tract, with a mouth and anus and a circulatory system. The group includes the classes *Platyhelminths*, *Nemathelminths*, *Annelida*, *Rotatoria*, and *Nemertea*: some authors include the *Prosopygii*.

Vermicelli. Same as MACARONI (q.v.), except that it is made smaller and solid instead of hollow.

Vermiculites. Group of minerals, belonging to the family of hydrous silicates, much resembling the micas in external appearance, but mainly products of the alteration of other minerals, and not always of definite chemical composition. When heated, they often curl up in a way that suggests the wriggling of worms.

Vermiformia. See POLYZOA.

Vermifuges, or VERMICIDES. Remedies to free the intestines and stomach from tapeworms and threadworms. Turpentine and extract of male-fern are given for the former, and santonin, cathartics and injections of salt, tea or quassia, for the latter.

Vermigli, PIETRO MARTIRE (called PETER MARTYR), 1500–1562. Italian reformer; prof. Strasburg 1543, Zurich 1556; in England 1547–53. *Loci Communes*, 1575.

Vermilinguia. Suborder of Lizards, with vermiform tongue, which can be protruded with great rapidity, to a con-

siderable distance. The body is flattened laterally, and covered with a shagreen-like skin. The parietal and occipital bones are firmly united. The group includes the Chameleons, whose feet have five toes arranged in two bundles, opposable for

Chameleon.

grasping. The tail also is prehensile. There are two layers of pigment cells (chromatophores) in the skin, the upper being yellowish, the deeper, brownish-black. By changes in the shape of these cells, stimulated by the light reflected from surrounding objects, the animal changes color rapidly.

Vermilinguia (ENTOMOPHAGA, EDENTULA; ANT-EATERS). Family of *Edentata*, having a long pointed snout and a thin worm-shaped tongue that can be protruded a great distance. Except in the AARDVARK (q.v.), there are no teeth, whence they are also termed *Edentula*. See PANGOLIN.

Vermilion. See MERCURIC SULPHIDE.

Vermont. One of the n.e. States; area 10,200 sq. m. Its surface is broken, the principal relief being produced by the Green Mts., which run in quite a continuous range from the s. to the n. boundary, rising in places to heights of 4,000 ft. Except the Connecticut River on the e. and Lake Champlain on the w., the State has no navigable waters. The Green Mts. and their slopes are made up of Archæan rocks, on the flanks of which are exposed those of the Cambrian period, while the lower country is covered with rocks of the Silurian age. The industries of the State largely consist of agriculture and sheep-raising. The principal city is Burlington, on Lake Champlain. Capital, Montpelier. V. was first settled by emigrants from Mass., who built Fort Dummer, near the site of Brattleboro, 1724. For years both N. Y. and N. H. laid claim to V., both colonies having given grants which covered the same territory in it. The majority of the settlers resisted the claims of N. Y. In 1776 the colony appealed to the Provincial Congress for admission into the confederacy, but were kept out by the influence of N. Y., and again 1777. Meantime the British generals were attempting to induce the people to aid the British cause, but they remained loyal to the colonies. In 1789 N. Y. waived its objections to the admission of V., and in 1791 she was admitted as the 14th State in the Union. The Vermonters were

Gathering Maple Sap.

loyal throughout the Revolution, "the Green Mountain Boys" under Ethan Allen capturing Ticonderoga and Crown Point. During the Civil War the State sent to the Union army 32,549 men out of 315,000. Pop., 1890, 332,422.

Vermont, UNIVERSITY OF. At Burlington, chartered 1791, opened 1800. The medical coll. was organized 1823, suspended 1834, and reorganized 1854; it has (1897) 21 professors and 221 students. The Vt. Agricultural Coll. was incorporated with the Univ. 1865. The academic department has 22 professors, 10 instructors, and 271 students. Women have been admitted since 1872. The library contains 51,000 vols. The courses offered lead to the usual degrees in arts, civil, electrical, and mechanical engineering, chemistry, and agriculture. The buildings are mainly new or newly reconstructed.

Vermouth. Various quantities of wormwood (*Artemisia absinthum*), hyssop, aniseed, sage, calisaya, cloves, coriander, orange peel, and other fragrant herbs, are put into a linen bag and hung in a white wine, at a temperature of 150° F., for four or five days; it is then squeezed and replaced for a month, the bag being squeezed at intervals of five days. It is then filtered and bottled, yielding an agreeable, bitter wine, varying in strength of alcohol up to 17 per cent, depending entirely upon the strength of the wine used. The Italian vermouth is sweeter than the French.

Vermuyden, SIR CORNELIUS, ab.1590–ab.1660. Dutch engineer employed in building dikes in Holland and in drainage operations in England. *Drayning of the great Fennes*, 1842.

Vernation, or PRÆFOLIATION. Arrangement of foliage leaves in the bud, in relation to their folding or imbrication among themselves.

Verne, JULES, b.1828. French semi-scientific romancer, whose works have been widely translated and highly popular. *Around the World in 80 Days; 20,000 Leagues under the Sea; From Earth to Moon; Mysterious Island; Dr. Ox.*

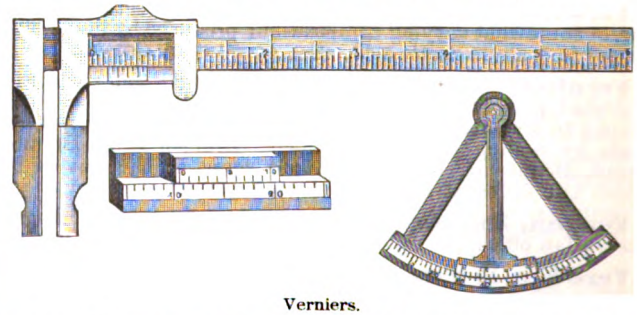
Verner, KARL ADOLPH, b.1846. Prof. Copenhagen 1883.

Verner's Law. In Philology; discovery by Karl Verner, 1875, which removed some apparent exceptions to Grimm's law, and proved that the Germanic languages had once, like the Greek, a movable accent.

Vernet, (EMILE JEAN) HORACE, 1789–1863. French military and historic painter, much favored by Bonaparte. Many of his works are at Versailles.—His father, "CARLE" (ANTOINE CHARLES HORACE), 1758–1836, painted landscapes, animals, and military scenes.—His father, (CLAUDE) JOSEPH, 1714–1789, was eminent as a marine painter.

Verneuil, PHILIPPE-EDOUARD POULLETIER DE, 1805–1873. French engineer, who shared in the survey of Russia under Sir Roderick Murchison.

Vernier. Apparatus invented by Pierre Vernier, 1580–1637, a Portuguese mathematician, to enable very close read-

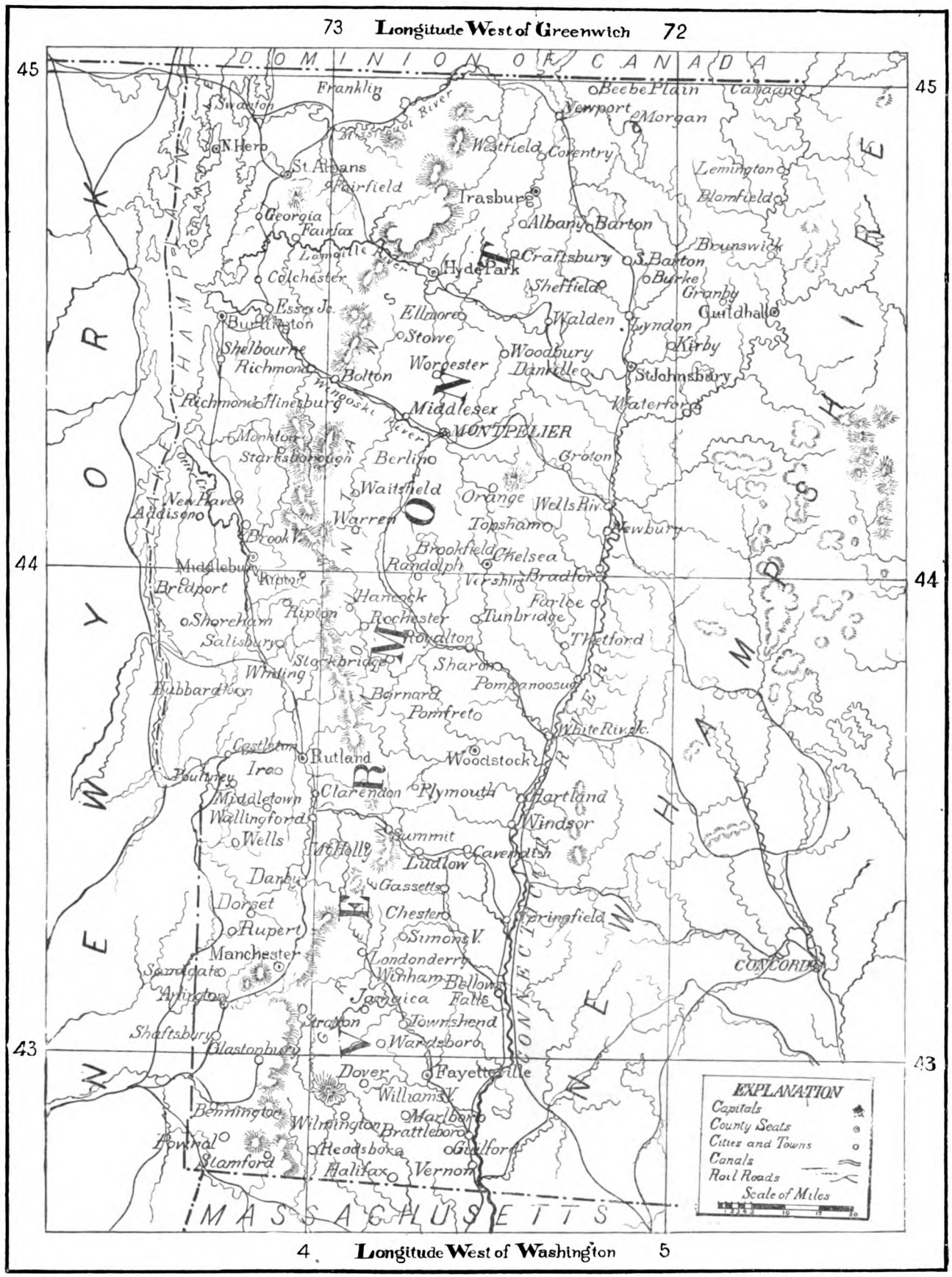


Verniers.

ings to be made with measuring instruments of relatively coarse graduation. If, *e.g.*, the main scale be divided into 25 equal parts, and there be a second scale at the side of the first whose zero mark is the gauge point, and which is graduated so that its 25 subdivisions are as long as 24 subdivisions of the main scale (starting from coincidence of zero marks) the mark of the second or vernier scale which coincides with a mark of the main scale shows how far the measurement has really come beyond the division of the main scale to which the zero of the vernier is nearest. If the main graduation be in N subdivisions, and the vernier has n subdivisions agreeing with N—1 subdivisions of the main scale, the reading will be to $\frac{1}{N \times n}$ of the primary unit. It is used on arcs of surveying and astronomical instruments, scales, calipers, and other exact apparatus.

Vernon, EDWARD, R.N., 1684–1757. Rear-admiral 1708; M.P. from 1727. He won much fame by taking Portobello, on the Isthmus of Panama, Nov. 1739: the event was celebrated by many medals. He failed in the attack on Cartagena 1741, as described by Smollett in *Roderick Random*, and at Panama 1742. He left the navy 1746. *Hist. Jamaica*, 1740.—His father, JAMES, was Sec. of State 1697–1700.

Vernon, GEORGE JOHN WARREN, BARON, 1803–1866. M.P. 1830, Peer 1835; writer on Dante.


73 Longitude West of Greenwich 72
45
44
43
4 Longitude West of Washington 5
DOMINION OF CANADA
MASSACHUSETTS
NEW HAMPSHIRE
NEW YORK
VERMONT
Franklin
Swanton
N. Hero
St. Albans
Fairfield
Georgia
Fairfax
Colchester
Essex Jc.
Burlington
Shelburne
Richmond
Bolton
Hinesburg
Monkton
Starksboro
Berlin
Waitsfield
Warren
New Haven
Addison
Brook V.
Middlebury
Bristol
Ripton
Shoreham
Salisbury
Hancock
Rochester
Stockbridge
Whiting
Hubbardton
Bernard
Pomfret
Castleton
Rutland
Iron
Poultney
Middletown
Clarendon
Wallingford
Wells
Mt. Holly
Ludlow
Dorset
Rupert
Manchester
Sandgate
Arlington
Shaftsbury
Glastonbury
Bennington
Pownal
Stamford
Wilmington
Readsboro
Halifax
Vernon
Brattleboro
Guilford
Marlboro
Williams V.
Dover
Wardsboro
Stratton
Jamaica
Townshend
Londonderry
Winham
Chester
Simons V.
Springfield
Bellows Falls
Rockingham
Grafton
Westminster
Lamoille River
Winooski River
Missisquoi River
White River
Connecticut River
Newport
Beebe Plain
Canaan
Morgan
Westfield
Coventry
Lemington
Brunswick
Bloomfield
Irasburg
Albany
Barton
Craftsburg
S. Barton
Burke
Granby
Guildhall
Hyde Park
Sheffield
Ellmore
Walden
Lyndon
Kirby
Stowe
Woodbury
Worcester
Danville
St. Johnsbury
Waterford
Middlesex
MONTPELIER
Groton
Berlin
Orange
Wells Riv.
Newbury
Topsham
Brookfield
Chelsea
Randolph
Vershire
Bradford
Fairlee
Tunbridge
Royalton
Thetford
Sharon
Pomfret
Pomfret
Woodstock
Plymouth
Hartland
Windsor
Summit
Cavendish
Gassetts
Springfield
Londonderry
Bellows Falls
Townshend
Wardsboro
Dover
Williams V.
Marlboro
Brattleboro
Guilford
Vernon
Halifax
Readsboro
Wilmington
Bennington
Manchester
Rutland
Woodstock
Windsor
Springfield
CONCORD
EXPLANATION
Capitals
County Seats
Cities and Towns
Canals
Rail Roads
Scale of Miles

Vernon, JANE MARCHANT (FISHER), 1796–1869. Anglo-American actress.

Vernon, ROBERT, 1774–1849. Founder of an art gallery in S. Kensington Museum, London, 1847.

Vernon-Harcourt, LEVESON FRANCIS, b.1839. Prof. Univ. Coll., London; hydraulic engineer. *Rivers and Canals*, 1882; *Harbors and Docks*, 1885; *Achievements in Engineering*, 1891.

Veron, LOUIS DESIRÉ, 1798–1867. Parisian journalist, speculator and author; Deputy 1852. *Mémoires*, 1854; *Théâtres de Paris*, 1860.

Verona. Ancient city of n. Italy, on the Adige, 72 m. w. of Venice; capital of Theodoric 489, and of the Lombards; ruled by the Scaligers 1260–1387, then by Milan, and by Venice from 1405; taken by the French 1796; held by Austria 1814–66; one of the four fortresses of the Quadrilateral. Here a Congress was held 1822 in the interest of the Spanish King, Ferdinand VII.; and near the city Charles Albert of Sardinia defeated an Austrian army May 6, 1848. There are manufactures of silk, wool and cotton, furniture and musical instruments. Pop., 1893, 69,900.

Veronese, PAOLO (CAGLIARI), 1528–1588. Last of the great Venetian painters. His characteristic works are enormous canvases, illustrating the actual Venetian life of his time under the disguise of Scripture subjects. Such are the *Feast in the House of Levi*, in the Venice Academy; *Marriage at Cana*, in the Dresden Gallery, and *Feast in the House of the Pharisee*, at the Louvre. As a colorist and brush painter he is of the first rank. In intellectual or decorative quality he is subordinate. The *Vision of St. Helena* in the National Gallery is his finest work from the standpoint of color.

Veronica, ST. In Catholic Legend, woman who, offering her handkerchief to the exhausted Saviour on the Via Dolorosa, received back His portrait imprinted upon it. It was given to St. Clement of Rome, and is kept at St. Peter's.

Verplanck, GULIAN CROMMELIN, 1786–1870. M.C. from N.Y. 1825–33; ed. Shakespeare, 1844–47. *Bucktail Bards*, 1819; *Doctrine of Contracts*, 1825.

Verrazano, G. See VERAZZANO.

Verres, CAIUS, ab.112–43 B.C. Proprætor in Sicily 73–71 B.C.; prosecuted by Cicero for his extortions. He fled to Marseilles, and was proscribed by Antony.

Verri, ALESSANDRO, COUNT, 1741–1816. Italian author. *Notti Romane*, 1780.—Of his brothers, PIETRO, 1728–1797, wrote on Political Economy, and CARLO, 1743–1826, on Agriculture.

Verriculate. Covered with thickset tufts of parallel hairs.

Verrius Flaccus. See FLACCUS, MARCUS V.

Verrocchio, ANDREA DEL, 1435–1488. Florentine painter and sculptor, greatest in the latter field. His equestrian

Statue of Colleoni, by Verrocchio.

statue of Colleoni at Venice ranks beside the Gattemelata of Donatello at Padua, these two being the greatest modern equestrian statues. His *Baptism of Christ* in the Venice Academy contains one head by his pupil, Leonardo da Vinci. As a painter his design is hard and formal, but severely accurate.

Versailles. City of France, 11 m. s.w. of Paris; seat of Assembly and government 1871–79. The palace, begun by Louis XIII., enlarged and occupied by his successors, was made a museum 1837. Here the treaty of peace between Britain and the U.S. was signed 1783, and here William was proclaimed Emperor of Germany Jan. 18, 1871. Pop., 1891, 51,679.

Versatile. In Botany, mode of attachment of the anther to the filament of a stamen in which the tip of the filament is fastened to the anther at one point only, as in grasses and lilies.

Verschoor, JULIUS WILHELM VAN, ab.1575–1640. Dutch admiral, active against Peru 1624.

Verse. Poetical line; in popular usage, stanza, or poetry in general.

Versed Sine. Trigonometric function, equal to unity minus the cosine.

Versor. In Quaternions, element which in the division and multiplication of vectors operates to turn the vector on which it acts into coincidence with the other. Its symbol is U.

Verst. Russian measure of length, containing 3,500 English feet.

Verstegan, RICHARD, d. ab.1635. English-Dutch printer and author. His *Theatrum Crudelitatum Hæreticorum*, 1587, is a R. C. pendant to Foxe's *Book of Martyrs*.

Verstovski, ALEXEJ NIKOLOJEVICE, 1799–1862. One of the founders of the national school of opera in Russia. His important operas are: *Pan Tverdewsky; Twelve Sleeping Virgins*, 1832; *Asskold's Grave*, 1835; *Longing for the Family*, 1839; *The Obvious Dream; Gromoboy*, 1858; *The Magician of Moscow*.

Vertebral Ossicles. Ambulacral plates of the starfish.

Vertebral Theory of Skull. Idea that the skull consists of modified and coalesced vertebræ; first promulgated by Oken; later independently by Goethe; developed by Owen. See CEPHALIC SEGMENTS.

Vertebrata. Bilaterally symmetrical animals, with an internal skeleton, consisting primarily of an axial notochord, usually modified to form a segmented, vertebral column. On its dorsal side lies the central nervous system (spinal cord), generally inclosed by arches formed by processes of the vertebræ. On the ventral side is a hæmal cavity, inclosing various viscera, its walls supported by ventral processes (ribs) from the vertebræ. The anterior end of the central nervous system is enlarged to form a brain, inclosed by a cartilaginous or bony cranium. Respiration is effected either by air-sacs (lungs), which are extensions of the wall of the anterior or pharyngeal portion of the digestive tract, or else by gills, borne by the pharynx, supported by cartilaginous arches, and separated by clefts that perforate the body wall in the region of the neck, for the exit of the water taken in at the mouth. The gill arches also contain vessels (aortic arches) that convey blood sent forward from the ventrally-placed heart into the dorsal aorta, which lies between the alimentary tract and the vertebral axis, and conveys the blood posteriorly. At most, there are two pairs of limbs. The sexes are nearly always in separate individuals. The group comprises the classes *Pisces*, *Amphibia*, *Reptilia*, *Aves*, and *Mammalia*. They may also be classed as *Ichthyopsida*, *Sauropsida*, and *Mammalia*.

Vertebrates, FOSSIL. See PALÆOZOÖLOGY and PALEONTOLOGY.

Vertical Gradient. Rate of change with altitude above the earth's surface; especially used in meteorology in reference to diminution of temperature and moisture, and increase of wind velocity.

Vertical Line. Path of a freely falling body, near the earth's surface; usually determined by a plumb-line. Vertical lines drawn at different points of the earth's surface converge nearly to the center of the earth.

Vertical Succession of Air-Currents. See LEY'S LAW.

Verticil. See WHORL.

Verticillaster. Inflorescence consisting of pairs of opposite sessile cymes or glomerules, as in many plants of the Mint family.

Verticillate, or WHORLED. Arrangement of leaves on

the stem, where several are borne at each node, as in the Lily and many other plants.

Vertigo. Dizziness or giddiness; disorder of the sense of equilibrium, characterized by an apparent whirling about either of the individual or of the objects around him. The former is subjective vertigo, the latter objective. The most common causes are disordered circulation in the brain and abnormal condition of the semicircular canals of the internal ear.

Vertot d'Aubœuf, RENÉ AUBERT DE, 1655–1735. French priest, historian of revolutions in Portugal, 1689, Sweden, 1696, and Rome, 1719, as also of the Knights of St. John, 4 vols., 1726.

Vertue, GEORGE, 1684–1756. English engraver and antiquarian.

Vertumnus. Roman god of the changing year, of exchange and trade, but specially of the transformations of the vegetable world; lover of POMONA (q.v.).

Verulam. See BACON, FRANCIS.

Verus, LUCIUS, 130–169. Son of Ælius; son-in-law of Marcus Aurelius, and his colleague in the empire from 161.

Vervain. See VERBENA.

Verviers. Town of Liege, e. Belgium, on the Vesdre, among the Ardennes. It has chalybeate springs and manufactures of cloth. Pop., 1891, 50,223.

Very, JONES, 1813–1880. American sacred poet.

Very Reverend. Title of a dean, and in R.C. Ch. of a vicar-general; also, in Scottish Presbyterianism, of the principal of a university.

Vesalius, ANDREAS, 1514–1564. Father of Anatomy; b. at Brussels; prof. Padua, Pisa, Bologna and Basel; surgeon to Charles V. 1544; condemned as a sorcerer, and sent for penance to Palestine 1563. His *De Corporis Humani Fabrica*, 1543, is of historical importance. *Works*, 1725.

Vesey, DENMARK, ab.1767–1822. Freedman of Charleston, S. C., planner of a negro insurrection; hanged with others.

Vesey, WILLIAM, 1674–1746. First rector of Trinity Ch., New York, from 1696; commissary of Bp. of London from 1712.

Vesicants. Substance which when applied to the skin will produce a blister; a preparation of cantharides, obtained from the Spanish fly, whence fly-blister, is most commonly used. See BLISTERS.

Vesica Piscis. Pointed oval figure formed by two equal circles, cutting each other in their centers; the form of the aureole, by which the Persons of the Holy Trinity and the Blessed Virgin are surrounded in mediæval paintings. It is found on panels and seals.

Vesicle. Small hollow body, like a bladder.

Vesicular. Composed of vesicles, or bearing them.

Vesiculata. See CAMPANULARIÆ.

Vespasian, TITUS FLAVIUS SABINUS, 9–79. 9th Roman emperor 70–79; of humble origin; military legate in Germany and Britain; consul 51; proconsul in Africa; commander against the Jews 67–69; proclaimed emperor at Alexandria 69; came to Rome 70 and applied himself to restore order; simple in mode of life, and exemplary in public and private character.

Laurelwreath-crowned Head of Vespasian on a bronze medal with the inscription: *Imp(erator) Caes(ar) Vesp(asianus) Aug(ustus) P(ontifex) M(aximus) T(ribunicia) P(otestate) P(ater) P(atriae) Con(sul) III Cens(or).*

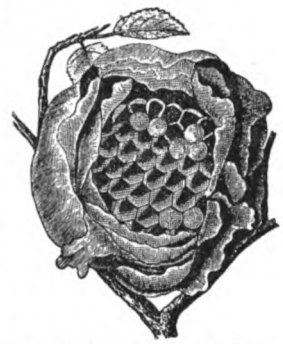
Vespers. Evening prayer; in R.C. Ch., between nones and compline.

Vespertilia. Group of *Microcheiroptera*, including the following families of BATS (q.v.): *Vespertilionidæ*, *Nycteridæ*, and *Rhinolophidæ*.

Vespertilionidæ. See BATS.

Vespidæ (WASPS). Family of *Aculeata*, including forms having a slender smooth body: the anterior wings are narrow and can be folded together longitudinally. They are social or solitary: the former approach bees in the organization of their colony. The nest is made of paper from chewed wood; the cells are in successive tiers or floors; the door is below. The larvæ are fed on insects that have first been well chewed, while the adult feeds on nectar and sweet juices. Most of the eggs hatch into workers or imperfect females. In the fall males and true females appear, copulation takes place in the air, the colony breaks up, and the fertilized female survives

Nest of Wood-wasp (*Vespa media*).


Nest of Common Wasp (*Vespa vulgaris*) seen from below.

in some protected place until the following spring, when she starts a new nest and soon has a worker progeny to help her build the nest larger. Some of the offspring may be females that produce males parthenogenetically. The solitary wasps construct mud cells in which usually caterpillars or spiders are stored for the developing young, thus resembling the FOSSORIA (q.v.).

Vespucci, AMERIGO (AMERICUS VESPUCIUS), 1451–1512. Florentine seaman, who visited uncertain parts of the New World under Spanish colors 1497 and 1499, and others, probably Brazil, in Portuguese ships 1501 and 1503. His *Letters*, pub. in various translations 1504 and later, gave the first account of these regions, and procured for him the undeserved honor (probably without willful falsehood on his part) of fixing his name, instead of that of Columbus, on the Western Continent.

Vessel. In Botany, long cell or series of longitudinally communicating cells whose walls are variously marked by thickenings of the cellulose composing them.

Vest, GEORGE GRAHAM, b.1830. Confederate Senator from Mo. 1863–65; U. S. Senator from 1879.

Vesta. Roman goddess of the hearth; identified with Hestia of the Greeks. Her eternal fire was supposed to have been brought from Troy by Æneas with the Penates. Her temple was the public hearth of the great Roman family.

Vestals. Six virgin priestesses of Vesta at Rome, who lived for thirty years in the cloister appointed for them at the end of the Forum, and were charged with the care of the eternal fire, and with certain sacrifices, which were considered necessary for the well-being of the state. Wills were often intrusted to their keeping, and they had special places assigned at the games, and enjoyed exalted rank and great privileges. If a Vestal broke her vow of chastity she was buried alive and her paramour scourged to death.

Half-figure of a Vestal.

Vestibule. Hall or antechamber, next the entrance of a house, whence the doors open to the various rooms; originally the entrance-chamber to the baths, where the clothes were laid aside.

Vestige, Vestigial. In Botany and Zoölogy, abortive representative of an ancestral or rudimentary organ.

Vestments. For R.C. priests celebrating mass, amice, alb, girdle, maniple, stole, and chasuble; for bishops, also dalmatic and tunic, with their emblems of office, ring, miter, staff or crosier, and pectoral cross. For Anglican clergy, surplice and stole, now worn over a cassock. The gown and bands, formerly much worn in the pulpit, are now generally disused. Various hoods indicate the doctorate.

Vestris, GAETANO APOLLINO BALDASSARE, 1729–1808. Dancer at the Paris opera 1819.—His son, MARIE AUGUSTE, 1760–1842, was prof. at the Conservatory.

Vestris, LUCIA ELIZABETH (BARTOLOZZI), 1797–1856. Actress of Italian descent, prominent in England 1820–54.

Vestry, or SACRISTY. 1. Room attached to the choir of a church, where the sacred vessels and vestments are kept and where the priest puts on his robes; on one side of the choir or behind the altar, at the east end. 2. In England, meeting of ratepayers to elect parish officers. 3. In P.E. Ch., lay officers of a parish.

Vesunna. See PERIGUEUX.

Vesuvianite. Essentially a calcium aluminium silicate, with other chemical elements in varying proportions. It was first found as a mineral on Mt. Vesuvius; but it is a common accessory ingredient in limestone and dolomite, frequently showing a resemblance to garnet, though it is tetragonal in crystallization, while garnet is isometric. See IDOCRASE.

Vesuvin. See BISMARCK BROWN.

Vesuvius. Volcano on w. coast of Italy, near Naples. Altitude 4,253 ft. An eruption 79 ruined Herculaneum and Pompeii. Since then it has erupted at intervals of a few years.

Vetancour, AGUSTIN DE, 1620–1700. Mexican priest and author. *Teatro Mexicano*, 1697–98.

Vetch, or TARE. Climbing herbs of the genus *Vicia*, natural family *Leguminosæ*, of wide geographical distribution. *Vicia sativa* is a leguminous forage plant, much esteemed in England, but not thriving well in the hotter and drier climate of the U. S. The tubers of some sorts are used for food.

Common Vetch (*Vicia sativa*): *a*, seed-pod.

Vetch, JAMES, 1789–1869. Scottish engineer, in Mexico 1824–35.

Vetch, SAMUEL, 1668–1732. Gov. of Nova Scotia 1710–13.

Vetchling. See PEA, EVERLASTING.

Veteran. Officer or soldier who has had experience in battle and campaign. In the U. S. service, enlisted men who have served meritoriously twelve years or more are classed as veteran soldiers.

Veterinary. Veterinary surgeons are appointed by the U. S. Sec. of War; they have the rank of sergeant-major and are entitled to the same allowances. One is allowed to each of the cavalry regiments with pay of $75 per month, and an additional one with pay of $100 per month to the 7th, 8th, 9th and 10th cavalry regiments.

Veterinary Medicine. That branch of medicine which treats of the ailments of domestic animals.

Vethake, HENRY, LL.D., 1792–1866. Prof. Rutgers 1813, Princeton 1817, Dickinson 1821–29, and Univ. Pa. 1836–59; provost 1854. *Political Economy*, 1838.

Vetillart, MARIE MICHEL HENRI, b.1848. French engineer, on the port of Calais 1875–92.

Veto. Denial of validity to legislation, or check upon administration. In the U. S. it is regulated by constitutional provisions.

Vettori. See VICTORIUS, PETRUS.

Veuillot, LOUIS, 1813–1883. Parisian journalist and novelist, vehemently ultramontane and polemic; ed. *L'Univers* 1843–60. *Melanges*, 18 vols., 1857–76.—His brother, EUGENE, b.1818, wrote *Guerres de la Vendée*, 1847.

Vexillar. Peculiar æstivation of the *Papilionaceæ*.

Vexilla Regis Prodeunt. One of the most famous Latin hymns; by Venantius Fortunatus, 569; for reception of a relic of the Cross; in the Breviaries, for Passion Week; much used in translations.

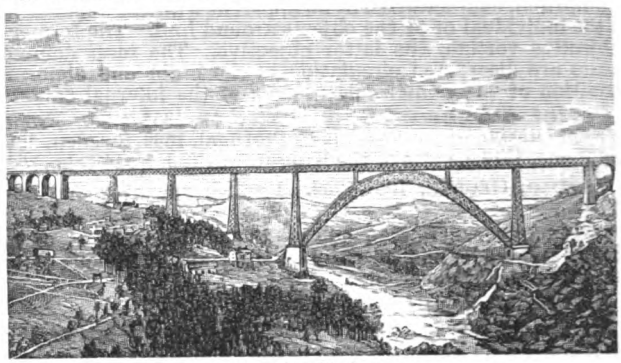
Vexillum. 1. Large posterior petal of the papilionaceous flower of the Pea family; called also the Standard. 2. Vane of the feather. See BARBS.

Veytia, MARIANO, 1718–1779. Historian of ancient Mexico. His work, pub. 1836, extends only to 1450.

Vezin, HERMANN, b.1829. American-English actor, in the U. S. only 1857–58.

Via Dolorosa. Way of Jesus to Calvary. A street in Jerusalem, so named, is supposed to mark part of it.

Viaduct. High trestle-work supporting a roadway or bridge over a valley having many high piers. The Kinzua viaduct on Lake Erie & Western R.R., in n. Pa., built 1882, is 2,050 ft. long and 302 ft. above the water surface. The Loa viaduct in


Garabit Viaduct.

Bolivia is 800 ft. long and 336 ft. above the water. The largest in the world, the Pecos viaduct, over the Rio Grande in Texas, built 1893, is 2,180 ft. long and 321 ft. above the water. See GARABIT.

Via Mala. Remarkable gorge in canton of Grisons, Switzerland, through which pass the Hinter-Rhine and the carriage road over the Splugen.

Viana, MIGUEL PEREIRA, 1779–1838. Brazilian official, Viscount 1823; historical writer.

Viardot, LOUIS, 1800–1883. French author, journalist, and translator. *Italian Art*, 1868, tr. 1870.—His wife, MICHELLE PAULINE (GARCIA), b.1821, m.1840, was well known 1839–62 as a mezzo-soprano in operas. She is also a composer.

Viareggio. Italian watering-place, on the Mediterranean, 14 m. n.w. of Pisa; created by draining adjacent marshes. Pop. ab. 10,000.

Viaticum. Mass, or Holy Communion, given (whether once or repeatedly) to a person near death.

Viaud, LOUIS MARIE JULIEN ("PIERRE LOTI"), b.1850. French impressionist novelist and naval officer; Academician 1891. *Aziyadè*, 1879; *Le Mariage de Loti*, 1880; *Mon frère Yves*, 1883; *Pêcheur d'Islande*, 1886; *Mme. Chrysanthème*, 1887; *Roman d'un Enfant*, 1890; *Fantome d'Orient*, 1892.

Viazemsky, PETER, PRINCE, 1792–1878. Russian poet, critic, and satirist. *Works*, 10 vols., 1889.

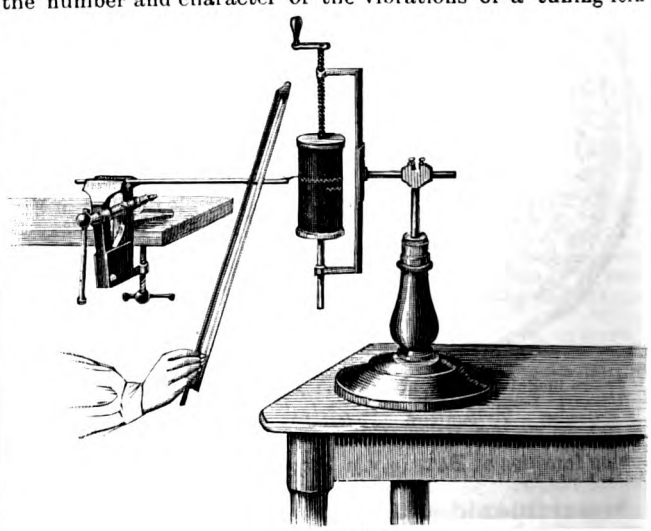
Vibert, JEHAN GEORGES, b.1840. Vivacious and talented French painter, without serious power.

Vibracula. Tentacle-like appendages that represent zoöids, situated on the Polyzoan colony.

Vibrio. Genus of flexible filamentous bacteria with sinuous motion.

Vibrissæ. 1. Stiff hairs, such as a cat's whiskers. 2. Stiff filoplumes at the angles of the mouth of birds.

Vibroscope. Apparatus devised by Duhamel, by which the number and character of the vibrations of a tuning-fork


Vibroscope.

or vibrating rod can be determined by a graphical mechanical method. It consists of a drum, covered with smoked paper, on the axle of which is a screw thread, fitting a nut in one of

its bearings. Thus, if the cylinder be revolved, it has a uniform lateral motion. In front of this cylinder a tuning-fork is made to vibrate. To one prong of the fork is attached a light stylus, brought just in contact with the blackened surface: in this way a curve characteristic of the note of the fork is traced on the paper.

Vicar. Ecclesiastical substitute; in Ch. of England, priest in charge of a parish whose temporalities are held by others.

Vicar Apostolic. Priest, or usually bishop, who governs an unorganized diocese as the simple representative of the Apostolic See.

Vicar-Forane. Bishop's deputy in part of a diocese; not known in the U. S.

Vicar-General. Bishop's deputy in a diocese or part of it.

Vicarious Sacrifice. See ATONEMENT.

Vicars, JOHN, 1582–1652. English theological and polemic writer.

Vice. Immoral habit, resulting from a defect or fault of character.

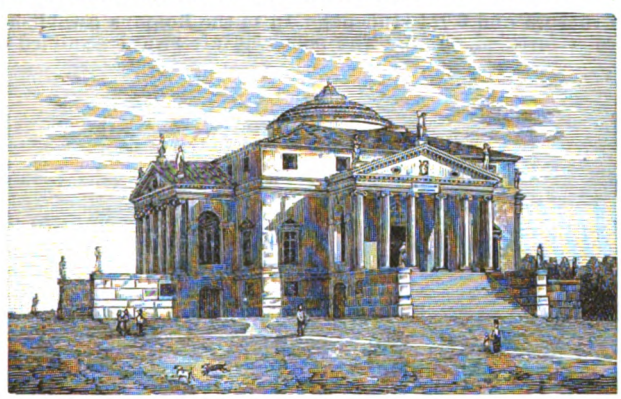
Vice-Admiral. Rank, in British navy, between admiral and rear-admiral; thrice bestowed in the U. S. navy; held by Farragut, Porter, and Rowan. It was abolished in 1890, upon the death of Rowan.

Vice-Consul. Consul's deputy, in British service appointed by Foreign Sec. on consul's nomination.

Vicente, GIL, 1470–ab.1538. Father of the Portuguese drama, and its chief writer; 42 of his plays remain, most of them in Spanish.

Vicente y Bennazar, ANDRES. Spanish cartographer, whose chart, pub. 1476, roughly anticipated the discovery of N. and S. America.

Vicenza. Ancient town of n. Italy, 42 m. w. of Venice; it was sacked by Alaric the Goth 401; sacked by Attila 452;



Villa Rotunda at Vicenza, by Palladio.

the Austrians took it in 1848. Notable for its buildings, especially those erected ab.1550–80 by Palladio. Its manufactures consist mainly of silk, cotton, wool and hemp. Pop. ab. 28,000.

Vice-President. Presiding officer of the U. S. Senate; elected quadrennially with the Pres., and his successor if he dies during his term.

Viceroy. Deputy of the sovereign in a province or colony, as in Mexico and Peru while held by Spain.

Vichy. Town of central France, on the Allier. Its mineral springs were known to the Romans, and are largely resorted to. The waters are both hot and cold, are alkaline, containing mostly sodium carbonate, and are charged with carbonic acid. They are valued for diseases of digestion, and more than 2¼ million bottles are exported annually. Pop., 1891, 10,525.

Vick, JAMES, 1818–1882. Anglo-American horticulturist.

Vicksburg. Capital of Warren co., Miss., on the Mississippi; founded 1826; largest city of the State, and one of the leading ports on the river. It has a large trade in cotton. Pop., 1890, 13,373, more than half colored.

Vicksburg, SIEGE OF. Farragut's attempt to capture the city, May 18–July 27, 1862, was unsuccessful. Grant moved from Grand Junction Nov. 26, intending to attack it from the rear, but failed in his plans for getting his troops to the point desired. Finally he took them down the right bank of the river; crossed by help of Porter's fleet to the left bank below the city; June 14, 1863, captured Jackson, won several battles, made an unsuccessful assault June 22, and then began a regular siege which resulted in the surrender of the town July 4, with 31,000 men and 172 guns: 10,000 men and 90 guns having been previously lost. The total Union losses in this campaign were ab. 10,000. Port Hudson fell July 9, and the Mississippi was open.

Vico, GIOVANNI BATTISTA, 1668–1744. Prof. Naples 1697; royal historiographer 1735; noted for the first application of philosophy to history. He called it *Una Scienza Nuova*, 1725–30. His works were collected 1818, 1835–37, and 1858–69.

Victor, AURELIUS. See VICTOR, SEXTUS AURELIUS.

Victor, CLAUDE PERRIN, DUC DE BELLUNO, 1764–1841. General 1793, Marshal 1807; prominent in Napoleon's wars; Minister of War 1821–23. *Mémoires*, 1846.

Victor, CLAUDIUS MARIUS, 5th cent. Latin poet of Gaul. His *Aletheia* is based on Gen. i.-xix.

Victor, SEXTUS AURELIUS, 4th cent. Latin historical writer.

Victor I. Bp. of Rome 185–197; native of Africa. He threatened to enforce the Roman observance of Easter by excommunicating dissidents, but was dissuaded by Irenæus.—II. GEBHARD, Bp. of Eichstädt; pope 1055–57.—III. DESIDERIUS, Abbot of Monte Casino; pope 1087.—IV. Two antipopes, 1138 and 1159–64.

Victor Amadeus I., 1587–1637. Duke of Savoy 1630.—II. His grandson, 1666–1732; duke 1675–1730; at war with France. He became king 1713, held Sicily 1713–20, and then gave it for Sardinia.—III. His grandson, 1727–1796; king 1773; at war with France 1794, which took Savoy and Nice from him 1796.

Victor Emmanuel I., 1759–1824. Son of Victor Amadeus III.; King of Sardinia 1802–21. His dominions, except the island, were held by Napoleon till 1814: a revolution forced him to abdicate.

Victor Emmanuel II., 1820–1878. King of Sardinia 1849, of Italy 1861; son of Charles Albert. He fought against Austria 1848, joined in the Crimean war 1854, secured the alliance of France against Austria and gained Lombardy 1859, acquired Sicily and Naples through Garibaldi 1860, formed an alliance with Prussia 1866, acquired Venice, and entered Rome, July 2, 1871. He deserved and won great popularity as a brave soldier and a constitutional king, who made no attempts at absolutism.

Victoria. British colony of s.e. Australia; organized 1850 from New S. Wales; area 87,884 sq. m. Its surface is somewhat broken, and in parts mountainous. The capital is Melbourne. The settlement was promoted by the discovery of rich gold mines 1851. Pop., 1891, 1,140,405.

Victoria. Capital of British Columbia since 1871; near s.e. end of Vancouver's Island; founded as a trading-post 1843. Pop., 1891, 16,841.

Victoria. See SWINE.

Victoria, ALEXANDRINA, b.1819. Queen of Great Britain and Ireland; daughter of Edward, Duke of Kent, and granddaughter of George III.; Queen 1837; m.1840 to her cousin, Prince Albert of Saxe-Coburg-Gotha, who d.1861; mother of

Queen Victoria in 1839.

nine children; proclaimed Empress of India 1876. Her reign has been one of unexampled peace and prosperity. Her Jubilee, or 60th anniversary of her accession, was celebrated with much pomp June 20–30, 1897.

Victoria, GUADALUPE (MANUEL FELIX FERANDEZ), 1789–1843. Mexican general and patriot, in revolt against Spain

1811–17, in hiding 1817–21; imprisoned by Iturbide 1822; first Pres. 1824–29. Under him slavery was abolished 1825.

Victoria Blue. $C_{33}H_{31}N_3Cl$. Hydrochloride of the product of the action of phenyl-α-naphthylamine on tetramethyldiamidobenzophenon chloride; bronze crystals which dye silk and wool blue in an acid bath, and cotton upon a mordant.

Victoria Cross. Bronze decoration, bestowed since 1856, with an annual pension of £10, on British soldiers, sailors, or volunteers, for conspicuous valor or devotion.

Victoria Falls. On the ZAMBESI (q.v.), lat. 17° 55′ S.; height 400 ft.

Victoria Green. See BENZALDEHYDE GREEN.

Victoria Land. 1. Island of N. America, in Arctic Ocean. 2. Antarctic region, with mountains 10,000 to 13,000 ft. high; discovered by Ross 1842.

Victoria Nyanza (UKEREWE SEA). Largest lake in e. Africa, on the head waters of the White Nile. Altitude 3,880 ft.; area ab. 27,000 sq. m. It was discovered by Speke 1858, explored by Stanley, 1875, and others, and is held by Britain and Germany. (See Map, page 1609.)

Victoria Orange. See VICTORIA YELLOW.

Victoria Regia. Species of plants of the genus *Victoria*, natural family *Nymphæaceæ*, found in the rivers of n.e. S. America. It is a large water-lily, with circular leaves, 6 ft. diameter, margins turned up, floating upon the water. The flowers are a foot in diameter, white, internally pink. The fruit is a globose capsule, 3 in. diameter, fleshy, with farinaceous seeds.

Victoria University. At Manchester; chartered 1880; established 1851 as OWENS COLLEGE (q.v.); unsectarian. It is federated with Univ. Coll. at Liverpool and Yorkshire Coll. at Leeds.

Victoria University. At Toronto; established as Victoria Coll., at Cobourg, Ontario, 1841; removed 1884; controlled by Methodists, but affiliated with Toronto Univ.

Victoria Yellow. Mixture of salts of dinitrocresols; prepared by the action of nitric acid on a mixture of cresol-sulphonic acids. It dyes wool yellow.

Victorius, PETRUS (VETTORI), 1499–1584. Florentine humanist, editor of Cicero, Aristotle, and other classics. *Variæ Lectiones*, 1582.

Victor Vitensis, 5th cent. Historian of Vandal persecutions in Africa.

Vicuña. Rare mammal of the group TYLOPA (q.v.), living on the heights of the Andes (above 13,000 ft.) in Bolivia and Peru, valuable for its exceedingly soft and silken wool. The Alpaca of the same regions is supposed to be a larger domesticated form of the same species. The Vicuña is found in flocks of young males or of females, with an old male for sentinel. They are secured by corraling. They are reddish-brown, with an apron of long white hair in front, and extending along the sides as far as the hind legs. With the Llama, Guanaco, and Alpaca, they constitute the genus *Auchenia*.

Vicuna (*Auchenia vicugna*).

Vicuña-Mackenna, BENJAMIN, 1831–1886. Chilian historical writer: in exile 1852–56 and 1859–62; Senator 1871–76. —His father, PEDRO FELIX, 1806–1874, was an author, journalist, and Senator.

Vida, MARCO GIROLAMO, ab.1485–1566. Bp. of Alba, n. Italy, 1532; Latin poet, noted for easy and graceful style. *De Arte Poetica*, 1527; *Christias*, 1535; *Bombyx* (on silkworms), 1537; *Scacchiæ Ludus* (chess), 1527. His works were collected 1732.

Vidal, PEIRE, ab.1175–ab.1215. Troubadour of Provence.

Vidaurre, MANUEL LORENZO DE, 1773–1841. Peruvian jurist and diplomatist.

Vidaurri, SANTIAGO, 1803–1867. Mexican officer and politician; Gov. of Nuevo Leon 1852; Minister under Maximilian 1864; executed.

Vidocq, EUGÈNE FRANÇOIS, 1775–1857. French adventurer and convict, chief of a bureau of spies and detectives 1812–25. His *Mémoires*, 1828, are of doubtful authorship and little value.

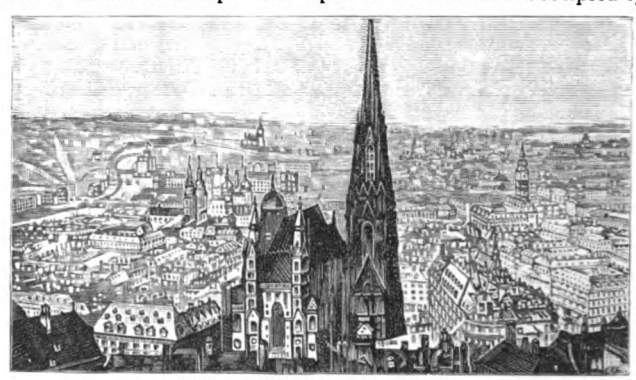
Vieira, ANTONIO, 1608–1697. Brazilian Jesuit, long in Europe; chief of Portuguese preachers, and eminent as an author.

Vieira, JOAO FERNANDES, ab.1600–1660. Brazilian revolutionist, active against the Dutch in Pernambuco.

Viele, EGBERT LUDOVICKUS, b.1825. Brig.-gen. U. S. Vols. 1861–63; engineer; M.C. from N. Y. 1885–87. *Atlas of New York City*, 1865.

Vien, JOSEPH MARIE, 1716–1809. French painter and art teacher.

Vienna. Capital and largest city of Austria, on the Wien near the Danube. It is the first manufacturing city of the empire, and has an extensive trade. Its libraries, art collections, and museums are important. Its univ., founded 1364, includes a notable school of medicine; it had in 1895 ab. 400 instructors and 6,714 students. In 14 the Romans established here a fortified camp. The spot was afterward occupied by Attila, and then by Avars, who were expelled by Charlemagne. The city received a charter 1237; increased rapidly during the crusades; was besieged unsuccessfully by Hungarians 1477, taken by M. Corvinus 1485, gallantly defended against the Turks 1529 and 1683, and occupied by the French 1805 and 1809. In 1866 the Prussians marched to within sight of its towers. The International Exhibition of 1873 was held here. Pop., 1891, with suburbs, 1,364,548.



Vienna in 1873—Looking Northeast.

Vienna, CONCORDAT OF. 1448, between Frederick III. and Pope Nicholas V. It retracted the resolutions of the Council of Basel as to restriction of papal abuses.

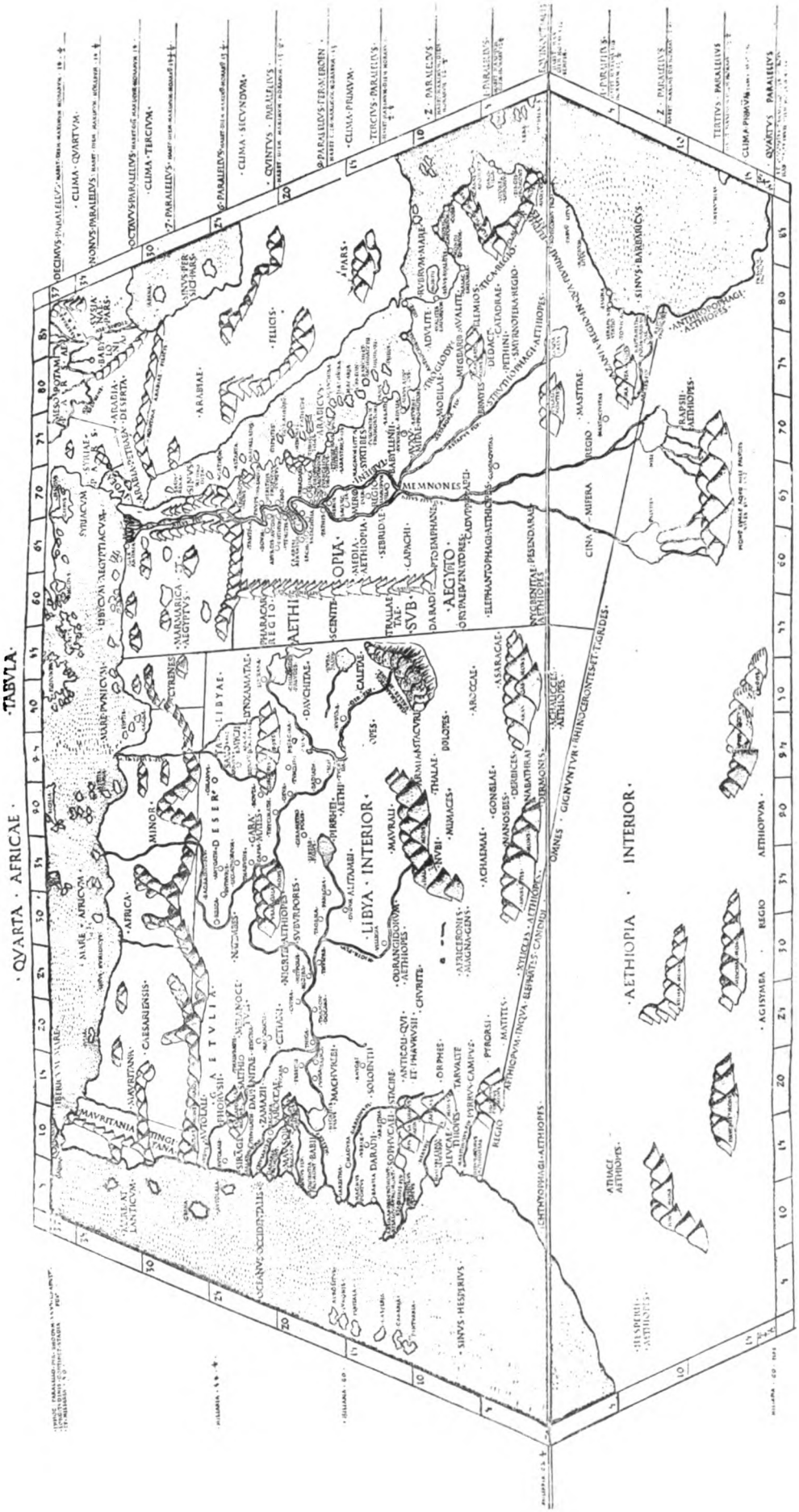
Vienna, CONGRESS OF. Composed of representatives of all European governments, who met, Sept. 30, 1814, to settle the affairs of Europe, after the 1st Peace of Paris. All the great powers obtained important accessions of territory. A new confederation of German states was formed, which continued till 1866. A formal treaty, the 5th of Vienna, was drawn up and signed, June 9, 1815. The Congress declared its determination to suppress the slave trade Feb. 8, 1815.

Vienna, PEACE OF. Between Italy and Austria; signed Oct. 3, 1866. Austria restored the iron crown of Lombardy; Italy abandoned the Trentino, and received Venetia.

Vienna, TREATIES OF. 1. Signed 1725–27 for Spain, Russia, and Prussia, guaranteeing the Pragmatic Sanction. 2. Concluded March 16, 1731. Great Britain and the Dutch states guaranteed the Pragmatic Sanction; Charles VI. agreed to the treaty of Seville, as respected the Italian duchies. 3. Nov. 18, 1738; Augustus III. was recognized as King of Poland; Stanislaus was to receive compensations for his abdication, in Bar and Lorraine. 4. Oct. 14, 1809. Austria ceded territory.

MAP OF AFRICA, FROM PTOLEMÆI COSMOGRAPHIA,

PUBLISHED AT ROME, 1490.



This Map Shows Lakes Victoria Nyanza and Albert Nyanza and the Mountains of the Moon as the Sources of the Nile.

5. See CONGRESS OF V. 6. Signed March 25, 1815, on Napoleon's return from Elba, renewing the alliance of Chaumont.

Vienna Caustic, or **Paste.** Mixture of quicklime and caustic potash used in medicine as a caustic.

Vienna Green. Name given to Paris green or SCHWEINFURTH GREEN (q.v.).

Vienne. Town of e. France, near the Rhone, 19 m. s. of Lyons; capital of the Allobroges; important in Roman times and later; notable for its remains of antiquity. A council met here 1312. Pop., 1891, 22,814.

Vieta, FRANCOIS, 1540-1603. French mathematician and councilor. His *Isagoge in Artem Analyticam*, 1591, is the earliest work on symbolic algebra. *Works*, 1646.

Vieussens, RAYMOND, 1641-1720. French anatomist. *Neurographia*, 1685.

Vieuxtemps, HENRI, 1820-1881. Belgian violinist and composer; pupil of De Beriot; solo performer to the Czar at St. Petersburg for five years; in America 1844, 1857, and 1870;

Henri Vieuxtemps.

prof. at the Conservatory of Brussels 1871. In 1873 a stroke of paralysis deprived him of the use of his right arm, and he spent his time in composing.

Vigfusson, GUDBRAND, 1827-1889. Icelandic writer, in England from 1864. *Icelandic Dictionary* (with R. Cleasby), 1873; *Sturlunga Saga*, 1878; *Corpus Poeticum Boreale* (with F. Y. Powell), 1883.

Vigil. Eve of a festival or fast; observed in R. C. Ch., and mentioned in English Prayer-book; origin of watch-night services.

Vigilance Committees. Formed at San Francisco 1851 and 1856, and in other Western settlements in their early and rude stages, to do justice upon criminals and preserve order when legal appliances and officers were lacking, inefficient, or corrupt; often parodied and abused, as by Ku-klux and Whitecaps. In 1877-78, during the labor riots, a committee of safety was formed in San Francisco, headed by W. T. Coleman (1821-1893), as were the committees of 1851 and 1856.

Vigilantius. Presbyter of Gaul, who traveled in the East ab.400, and anticipated Protestantism in opposing monachism and saint worship; known only by Jerome's book against him.

Vigilius. Pope 537-555; appointed and maintained by Justinian.

Vignaud, JEAN HENRI, b.1830 in New Orleans. Diplomatic official, long in Paris. *L'Anthropologie*, 1861.

Vignes, PIERRE DES, ab. 1190-1249. Italian poet, said to have invented the sonnet.

Vignette. Picture on the title-page of a book.

Vignette. Running ornament of leaves and tendrils in the hollow moldings in Gothic architecture.

Vignola. Town near Modena, Italy; birthplace of Jacopo Barozzo, or Barocchio, 1507-1573, who is often known by this name. He succeeded Michelangelo as architect of St. Peter's.

Vigny, ALFRED VICTOR, COMTE DE, 1799-1863. French poet, dramatist, and romancer. *Cinq-Mars*, 1826; *Chatterton*, 1835; *Destinées*, 1864. *Works*, 6 vols., 1863-66.

Vigo. Seaport of n.w. Spain, taken by the British 1585, 1589, and 1719. In its bay a British and Dutch fleet won a victory 1702. Pop. ab.15,000.

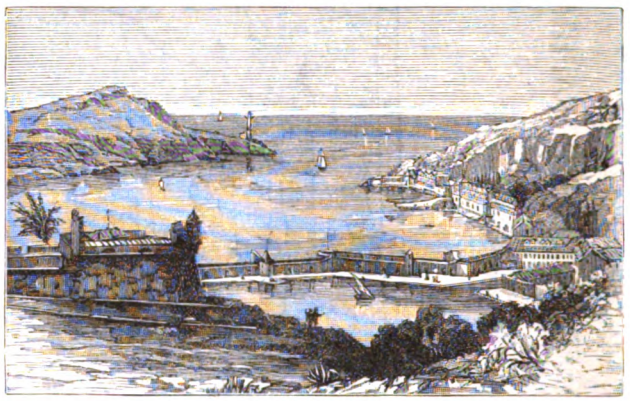
Vikings. Pirate chiefs among the Northmen, who plundered the coasts of Europe ab.700-1000.

Vilas, WILLIAM FREEMAN, b.1840. Postmaster-gen. 1885-87; Sec. of Interior 1887-89; U. S. Senator from Wis. 1891.

Vilayet. Turkish province, formerly eyalet.

Vilers, CHARLES MARIE LE MYRE DE, b.1833. French gov. of Cochin-China 1879-82; envoy to Siam 1893, and to Madagascar 1888 and 1894; instigator of its subjection to France.

Villafranca. Town of Lombardy, 12 m. n. of Mantua. Here France and Austria arranged the preliminaries of peace July 11, 1859, after Solferino, afterward ratified in the treaty



Villafranca.

of Zurich. Lombardy was taken from the Austrians, who were allowed to retain Venetia. It has a fine castle of the 14th century. Pop. 3,986.

Village Community, IN ECONOMIC HISTORY. Unit of organization among many ancient and some modern tribes; group of peasants occupying a village and adjoining tract of land, and pursuing most of the affairs of life in common.

Villagra, GASPAR DE, ab.1550-ab.1620. Participant in the conquest of New Mexico 1600, and its historian 1610.

Villagran, FRANCISCO DE, 1507-1563. Gov. of Chili 1554-57 and from 1561; at war with the Araucanians.

Villalobos, FRANCISCO LOPEZ DE, 1473-ab.1545. Portuguese physician and author. *Problemas*, 1515.

Villani, GIOVANNI, ab.1276-1348. Florentine historian. His work is valued both for style and substance: it was carried further by his brother and nephew.

Villanovanus Arnaldus. Eminent Italian physician, who lived from ab.1235-1312. He wrote much on alchemy, medicine and religion.

Villanueva, JOAQUIN LORENZO, 1757-1837. Spanish liberal priest. Deputy 1808-14 and 1820-23; imprisoned 1814-20; in exile from 1823; historical and political writer. *Phœnician Ireland*, tr. 1832.

Villard, HENRY, b.1835 in Bavaria. Pres. Northern Pacific R.R. 1881-84.

Villaret de Joyeuse, LOUIS THOMAS, 1750-1812. French admiral 1793; distinguished in action with a British fleet May 1794; Gov.-gen. of Martinique 1802-9.

Villari, PASQUALE, b.1827. Prof. Pisa 1859, Florence 1866; author of historical, critical, and political works; Senator 1884; Minister of Instruction 1891. His important lives of Savonarola, 1859-61, and Machiavelli, 1877-82, and *Two first Centuries of Florentine History*, 1893-94, were tr. by his wife, Linda (White), who has pub. sundry novels.

Villari's Critical Value. "Magnetism, induced or residual, in an iron or steel wire, is diminished on stretching, provided that the magnetization correspond to an inducing force above this value, which, according to Lord Kelvin, is ab. 24 times the terrestrial intensity. Below this critical value,

tension increases the magnetization. In nickel the magnetization is always diminished. The effects of transverse expansive stress are opposed to those of longitudinal stretching."

Villars, CHARLES, ab.1760–1814. French physician, introducer of vaccination in Spanish America.

Villars, CLAUDE LOUIS HECTOR, DUC DE, 1653–1734. French general; Ambassador to Austria 1699–1701; commander in Germany 1702–3; Marshal 1702; victorious at Höchstädt Sept. 1703; defeated at Malplaquet Sept. 1709. He defeated the British and Dutch at Denain July 1712.

Villars, DOMINIQUE, 1745–1814. French botanist. Prof. Paris 1794, Strasburg 1805. *Histoire des plantes du Dauphiné*, 1786–89; *Catalogue des substances végétales*.

Villasenor y Sanchez, JOSÉ ANTONIO, ab.1700–ab.1760. Mexican geographer.

Villaverde, CIRILO, b.1812. Cuban novelist, in exile from 1849. *Cecilia Valdés*, 1881.

Villefranche, CHARLES PIERRE DE, 1756–1809. Cuban historical writer, b. at Mobile.

Villegaignon, NICOLAS DURAND, CHEVALIER DE, 1510–1571. French soldier and writer, founder of an unsuccessful colony in Brazil, 1555–67.

Villegas, ESTEBAN MANUEL DE, 1595–1669. Spanish lyric poet. *Amatorias*, 1618.

Villehardouin, GEOFFROI DE, ab.1160–ab.1213. French historian of the Latin conquest of Constantinople, in which he took part. His book (if it be his) extends 1198–1207, was pub. 1585, and is highly valued.

Villeins, or VILLAINS. Class of non-free inhabitants in early English law, who were tied to the land, but held it so long as they rendered due service to their lords.

Villèle, JEAN BAPTISTE SÉRAPHIN JOSEPH, COMTE DE, 1773–1854. French royalist; Deputy 1815; ennobled 1820; Finance Minister 1821–28.

Villemain, ABEL FRANÇOIS, 1790–1870. Prof. Paris 1810; Academician 1821; Peer 1831; perpetual sec. of the Academy 1832; Minister of Instruction 1839–44; historian and critic. *Cromwell*, 1819; *Lascaris*, 1825; *Melanges*, 1823–27; *Cours de Littérature Française*, 1828–30; *Chateaubriand*, 1857; *Grégoire VII.*, 1873.

Villemarque. See LA VILLEMARQUE.

Villemarque, HOUSART DE LA, VICOMTE, 1815–1895. Collector of Breton folklore.

Villena, ENRIQUE DE, 1384–1434. Spanish poet, tr. Virgil and Dante.

Villeneuve, ALEXANDRE LOUIS DUCREST DE, 1777–1852. French Post-captain 1814, Rear-admiral 1829; author of W. Indian charts.

Villeneuve, JULES EDMOND FRANÇOIS DE, 1804–1863. French writer on Brazil.

Villeneuve, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE, 1763–1806. French Rear-admiral 1797; commander of the rear division at the battle of the Nile Aug. 1, 1798, from which he escaped with 5 ships; Vice-admiral 1804; defeated by Nelson at Trafalgar Oct. 21, 1805.

Villeraye, CHARLES STANISLAS, VISCOUNT DE, ab.1820–1854. French filibuster in n.w. Mexico.

Villeré, JACQUES, 1761–1831. Gov. of La. 1818–22.

Villermet, JULES GUILLAUME FERDINAND DE, 1802–1859. French explorer in Mexico and Central America 1854–59. *Voyage*, 1860.

Villeroi, FRANÇOIS DE NEUVILLE, DUC DE, 1644–1730. Marshal of France 1693; defeated at Ramillies by Marlborough; guardian to Louis XV.

Villers, CHARLES FRANÇOIS DOMINIQUE DE, 1765–1815. French writer, in Germany from 1793. *Spirit of the Reformation*, tr. 1805.

Villiers, BARBARA, 1640–1709. Wife of Roger Palmer. Mistress of Charles II. of England ab.1659, Countess of Castlemaine 1661, Duchess of Cleveland 1670, m. Robert (Beau) Fielding 1705; mother of Dukes of Cleveland (1662–1730), Grafton (1663–1690), and Northumberland (1665–1716).

Villiers, CHARLES PELHAM, 1802–1898. M.P. from 1835; reformer.

Villiers, FREDERIC, b.1852. English war correspondent.

Villiers, GEORGE. See BUCKINGHAM.

Villiers, G. W. See CLARENDON.

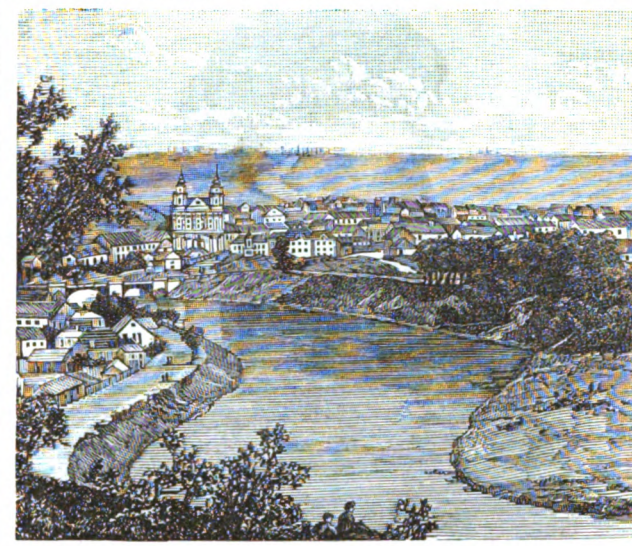
Villmorgen, BATTLE OF. In Switzerland 1712. It gave Zurich and Berne ascendency in the Confederation.

Villoison, JEAN BAPTISTE GASPARD D'ANSE, 1753–1805. Prof. Coll. de France 1800; writer on Greek classics.

Villon, FRANÇOIS (MONTCORBIER), 1431–ab.1489. French poet, of fine talent and scandalous life; sentenced to banishment for homicide 1455, and to death for burglary 1456; again in prison 1461. *Petit Testament*, 1456; *Jargon; Grand Testament*, 1461. His works were collected 1489, often reprinted, and tr. 1878.

Vilmar, AUGUST FRIEDRICH CHRISTIAN, 1800–1868. Prof. Marburg 1855. *Hist. German Literature*, 1845; *Theology of Fact*, 1854.

Vilna, or WILNA. Town of w. central Russia, on a branch of the Niemen; capital of Lithuania from 1323; site of a univ.



Vilna—View taken from the Snipiski Suburb.

1576–1830. It has several institutions of learning, and a large trade in timber and grain. Pop., 1891, 109.363, mostly Poles.

Vimiera, or VIMEIRO. Town of Portugal, 30 m. n. of Lisbon; scene of Wellesley's victory over Junot, Aug. 21, 1808. This was followed by the Convention of Cintra, Aug. 30, and the evacuation of Portugal by the French.

Vimineous. Producing long flexible branches, as in willows.

Vincennes. E. suburb of Paris; noted for its park and old castle, now a fort. Here Duc d'Enghien was executed by Napoleon's order 1804. Pop., 1891, 24,626.

Vincennes. Oldest town in Indiana; capital of Knox co.; on the Wabash; site of a French fort ab. 1722; held by the British 1763–79, and by Va. till 1783; capital of Northwest Territory 1800–13. Pop., 1890, 8,853.

Vincennes, JEAN BAPTISTE BISSOT, SIEUR DE, 1688–1736. Canadian explorer, b. in Quebec. He preserved Detroit from an Indian invasion 1712, built an earth fort at Vincennes, Ind., ab.1722, and was taken and burned by Chickasaws.

Vincent, ST., d.304. Spanish martyr, celebrated Jan. 22.

Vincent, CHARLES EDWARD HOWARD, b.1849. Journalist; M.P. 1884; writer on military and police topics.

Vincent, FRANCIS, 1822–1884. Journalist at Wilmington, Del. *Hist. Delaware*, 1870.

Vincent, FRANK, b.1848. American traveler. *Land of the White Elephant*, 1874; *Burmah*, 1877; *Cambodia*, 1878; *S. America*, 1888; *Central America*, 1889; *Actual Africa*, 1895.

Vincent, JOHN HEYL, D.D., LL.D., b.1832. Chancellor of Chautauqua Assembly 1884; M.E. Bp. 1888; writer on Sunday-schools.

Vincent, MARVIN RICHARDSON, D.D., b.1834. Prof. Union Theol. Sem., New York, 1888. *Word Studies in N. T.*, 1887–90.

Vincent, MARY ANNE (FARLEY), 1818–1887. Anglo-American actress.

Vincent de Paul, ST., 1577–1660. French priest, slave in Tunis 1605–7; active philanthropist; founder of the Sisters

of Charity, and of the Lazarists or Priests of the Missions; canonized 1737. His day is July 19.

Vincentians. Secular R.C. priests, not under a monastic rule, but under obligations to hear confession and preach among the poor.

Vincent of Beauvais, d. ab.1264. French Dominican. *Speculum majus*, pub. 1473.

Vincent of Lerins, 5th cent. Author of *Commonitorium*, a semi-Pelagian work of repute.

Vinci, LEONARDO DA, 1452–1519. Florentine painter. His *Last Supper* at Milan, finished ab.1498, was an epoch-making work, having no even remotely equal predecessor and no following superior. In all things he was the forerunner, founder, and spiritual father of the greatest Italian art. His works are rare: several ascribed to him are known to be by scholars. His most accessible authentic oil paintings are the *Mona Lisa* portrait and *The Virgin and St. Anne* of the Louvre. His car-

Leonardo da Vinci.

toon of *The Battle of the Standard*, designed for a fresco in Florence which was never executed, survives in an old engraving of one of its groups. He was a talented sculptor, but no works of his survive. He was also musician, poet, military and civil engineer, expert in gunnery and irrigation, author, and scientist of wide attainments. He was prominent at Milan till 1498, then served for some years as engineer to Cesare Borgia. He left Italy for France 1516. See LORD'S SUPPER.

Vincis, PETRUS. See PETER DE VINCIS.

Vinculum. Straight line placed above an expression to show that it is taken as one quantity and subject to one or more operations. Its most common use is in connection with the radical sign.

Vine. Grapes have been cultivated and wine has been made from them from the earliest times. The vines of Europe came from Asia by the Mediterranean. They were carried to England by the Romans early in the Christian era; in Gaul 270. Madeira received its vines from Cyprus 1420; to America they were indigenous. The best wines are obtained from grapes grown on clayey, sandy, and slaty soil, of indifferent value for the growth of cereals. The volcanic soil of Madeira produces rich wines, but would hardly support other vegetation. The soil affects the quality of the wine. The higher the average temperature the larger the quantity of wine and the higher the percentage of alcohol. The quality, however, will not be proportionate to the quantity. The vines are generally kept to a height of 3 ft., so that the grapes are exposed to the sun and the reflection from the ground. In the Burgundy wine district, the ground is laid out in ditches 5 ft. apart and 1½ ft. deep, partly filled with manure. Vine-cuttings 1½ ft. long are placed in these, ½ foot apart, bending toward the ridge; they are covered with earth, with two buds above it. The first and second years they are hoed two or three times. In the latter year they are pruned to two buds and manured. The third year they are pruned to two branches, each with two buds, and furnished with a stake of 4 ft. length. In the 4th or 5th year ditches are made from the vine to the middle of the rows and the vine is drawn into this ditch, one branch remaining with the root and the other being bent to the middle of the row. Thus the rows of vines are about 2½ ft. apart. Each vine has one stem and begins to bear in the fifth or sixth year. When the vine has grown too high, it is laid down in a ditch and the yearling branch is bent upward and pruned to three buds. About $\frac{1}{10}$ are so laid yearly, so that the vineyard is renewed every ten years. A variety of grapes are grown here, the Pineau and the Gamay being the chief ones. The Pineau bear up to 1½ lbs. of grapes, the Gamay three times as much. Small proprietors sell their grapes to wine-dealers, or make an inferior wine. The larger growers make their wines. In the U. S. the vines are often trained to a wire trellis, 5 to 6 ft. high, with 2 or 3 wires. The vines are planted 6 to 8 ft. apart. The U. S. has 500 varieties of indigenous grapes; of these 25 are valuable. In 1890 there were 51,000 acres of vineyards in N. Y. region; 42,633 in Ohio-Illinois region; 17,306 in Kansas-Missouri region; 17,092 in Virginia-Georgia region; 213,230 in Pacific region; elsewhere in the U. S. 60,000: total, 401,261 acres. The diseases of the vine are the European mildew, *Oidium*, which is cured by dusting with sulphur; downy mildew, *Peronospora viticola*, which is treated with ammonio-carbonate of copper solution. These two affect the leaves. The black rot, *Læstadia bidwellii*, causes shriveling and decay of the grapes, and is treated as the last. Of insects are the thrip or leaf-hopper, which is sprayed with petroleum emulsion; and the PHYLLOXERA (q.v.), which attacks the roots; for this, coal-tar and sulpho-carbonate of lime have been used. This last pest was carried from the U. S. to Europe. Many American vines resist this disease, and a large acreage of land in France has been planted with these vines as stocks on which to graft the French vines.

Vine. Properly, the grape; in America, any climbing plant.

Vine, SIR JOHN RICHARD SOMERS, b.1847. London official, knighted 1886. *Municipal Institutions*, 1878.

Vinegar. The best vinegar is made from cider in which the fermentation has proceeded till acetic acid is formed. Of late acetic acid is so easily and cheaply made from the destructive distillation of wood that the manufacture of vinegar from apples is seldom profitable. It is also made by the acetic fermentation of wine, solution of malt, and dilute alcohol, by action of the vinegar plant. It contains 2.5 to 4.6 per cent of acetic acid.

Vinegar, AROMATIC. Dilute solution of acetic acid flavored with oils of lavender, rosemary, juniper, peppermint, cinnamon, lemon, and cloves; or flavored with rose-geranium and oil of cloves.

Vinegar Eel. See ANGUILLIDÆ.

Vinegar Plant. *Saccharomyce mycoderma.* Minute plant of the subkingdom *Protophyta*, causing the acetous fermentation of alcoholic solutions.

Vinegar Hill. In s.e. Ireland; scene of defeat of rebels by British troops June 21, 1798.

Vine Mildew. See OIDIUM.

Viner, CHARLES, 1680–1756. Benefactor of Oxford. *General Abridgment of Law and Equity*, 24 vols., 1741–51.

Vines, RICHARD, ab.1585–1651. Agent of Sir F. Gorges in Me. 1616–17; founder of Saco, Me.

Vines, SYDNEY HOWARD, F.R.S., b.1849. Prof. of Botany at Oxford 1888. *Physiology of Plants*, 1886.

Vinet, ALEXANDRE RUDOLPHE, D.D., 1797–1847. Swiss Reformed theologian, prof. Lausanne 1837–45; eminent as a literary critic. *Pastoral Theology*, tr. 1852; *Homiletics*, tr. 1853; *Hist. French Literature in 18th Century*, tr. 1854; *Studies in Pascal*, tr. 1859; *Outlines of Philosophy*, tr. 1865.

Vingt-Un. Game of cards, played by any number of persons, with pack of 52 cards; aces counting 1 or 11, others according to the spots, face cards 10. After the stakes are made, one card is dealt face down to each player, beginning at the left and this repeated; sometimes the first card is examined before the stake is made and the dealer may require the players to double their stakes, after seeing his first card. The players then examine their hands; if one has a natural Vingt-un, an ace and a face card or 10, he declares it and receives double his stake. The dealer deals to the players successively as many cards as requested, face up. If the hand amounts to more than 21, the player bursts and pays his stake to the dealer. When all have played, the dealer turns his cards and stands, or draws cards. If he bursts he pays those remaining in; if he does not burst, he pays those nearer 21 and stands off ties; he receives from those lower, and if he has a natural he receives double.

Vining, JOHN, 1758–1802. Delegate to Congress 1784–86; M.C. from Del. 1789–93; U. S. Senator 1793–98.

Vinland. Part of N. American continent discovered by Norsemen ab.1000; probably in Mass. or R. I. A stone tower has been erected at Waltham, Mass., by Prof. Hosford, to mark the site of an old Norse settlement, which he claims to have identified with this locality.

Vinometer. Form of HYDROMETER (q.v.), used for testing the alcoholic strength of wine.

Vinton, ALEXANDER HAMILTON, D.D., 1807–1881. Rector in Boston 1842–58 and 1869–77, Phila. 1858–61, and New York 1861–69; eminent as a preacher.—Of his brothers, FRANCIS, D.D., S.T.D., D.C.L., 1809–1872, rector in Providence 1840–42, Newport 1842–44, Brooklyn 1844–46, and Trinity, New York, 1855–72; pub. *Evidences*, 1855, and *Canon Law*, 1870: DAVID HAMMOND, U.S.A., 1803–1873, was chief quartermaster in Mexico, 1846–48, and elsewhere: JOHN ROGERS, U.S.A., 1801–1847, was killed at Vera Cruz.—His son, FRANCIS LAURENS, 1835–1879, was Brig.-gen. U. S. Vols. 1862–63, and prof. Columbia 1864–77.

Vinton, FREDERIC PORTER, b.1846. Boston painter, chiefly of portraits.

Vinton, JOHN ADAMS, 1801–1877. American genealogist.

Vinton, SAMUEL FINLEY, 1792–1862. M.C. from Ohio 1823–37 and 1843–51.

Vinyl. Chemical group CH_2:CH.

Vio, THOMAS. See CAJETAN.

Viola. Alto violin, called tenor in England, larger than the violin and having its four strings tuned a fifth lower. Its tone is not brilliant, but has great richness and is productive of fine effects in the orchestra. It was formerly called viola da braccio, or arm viol, to distinguish it from the viola da gamba, or knee viol.

Viola da Gamba. See VIOLONCELLO.

Violaniline. See INDULINE.

Violaceæ. Natural family of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 24 genera and ab. 270 species, distributed throughout all parts of the earth; called the Violet family.

Violet. Plants of the genus *Viola;* low herbs of the natural family *Violaceæ*, of numerous species and wide distribution. The cultivated Sweet Violet is native of Europe, and highly esteemed as an ornamental and fragrant flower. See PANSY.

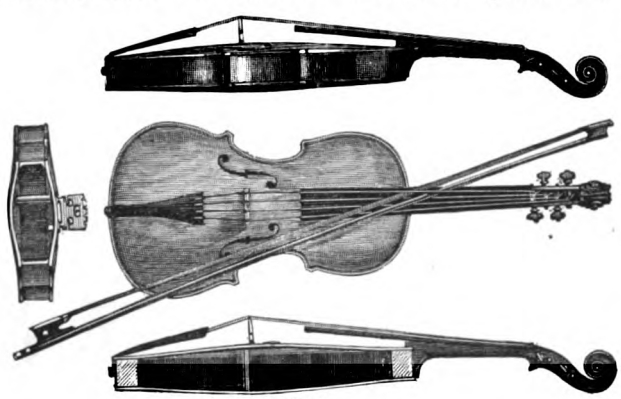
Violet, DOG'S-TOOTH. See ADDER'S TONGUE.

Violet, GREEN. *Cubelium concolor*. Large herb of the Violet family, native of the e. U. S.

Violet, WATER. See FEATHERFOIL.

Violet Stones. Stones found upon the Riesengebirge and the Brocken, which emit a smell due to the Violet Moss with which they are covered.

Violin. Small viol; stringed instrument, played upon with a bow of resined horsehair; most useful member of the orchestra, and after the human voice the most expressive of all musical instruments. Its origin, which was doubtless Oriental, cannot be traced with exactness. It was developed out of the



Violin.

larger viols ab.1480–1530, and reached its perfection in the masterpieces of the Cremona school ab.1710. It has a range of over three octaves, G below the treble staff upward, with all the semitones between, and is capable of many effects due to various devices in manipulation.

Violle, JULES, b.1841. Prof. Paris 1890; writer on light and heat. *Cours de Physique*, 1881.

Viollet-le-Duc, EUGÈNE, 1814–1879. French architect and authority on Mediæval architecture. His great *Dictionary*, 10 vols., 1854–69, and *Discourses on Architecture*, 1858–68, are his best-known works—the latter has been translated by Van Brunt.

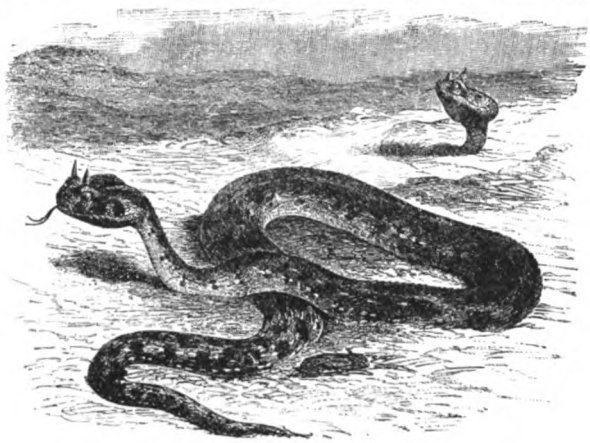
Violoncello. Bass instrument of the viol tribe, midway in size between the viola and the double bass. It has four strings, tuned like those of the viola, but an octave lower, and is held between the knees when played, wherefore in its earlier form it was called viola da gamba, or knee viol.

Vioménil, ANTOINE CHARLES DU HOUX, BARON DE, 1728–1792. French general, active in Corsica, Poland, and the U. S.; Gov. of La Rochelle 1783–89; mortally wounded in defending Louis XVI.—His brother, CHARLES JOSEPH HYACINTHE, became Major-gen. 1780, fought with Condé 1792–97, served in Russia, commanded the Portuguese army 1801–8, and was made Marshal 1816 and Marquis 1817.

Vionville, BATTLE OF. Aug. 16, 1870. See MARS-LA-TOUR.

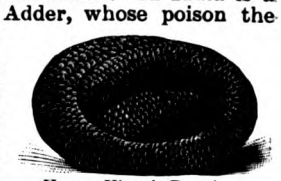
Viotti, GIOVANNI BATTISTA, 1753–1824. Italian violinist, composer of 29 concertos and many smaller pieces.

Vipers. Old World snakes of moderate size and viviparous reproduction, having no pits, as in *Bothrophera*. The Horned



Horned Viper (*Vipera cerastes*).

Viper, *Vipera cerastes*, was Cleopatra's snake. In India is a Tree Viper; and in Africa a Puff Adder, whose poison the Bushmen use for their arrows. This attains a size of four or five feet, and is very poisonous. England has but one poisonous snake, the Adder (*Pelias verus*). It has a zigzag chain of dark dorsal spots on an olive-brown ground. The common viper of Europe is *V. aspis*. See SOLENOGLYPHA.



Young Viper's Position in the Egg.

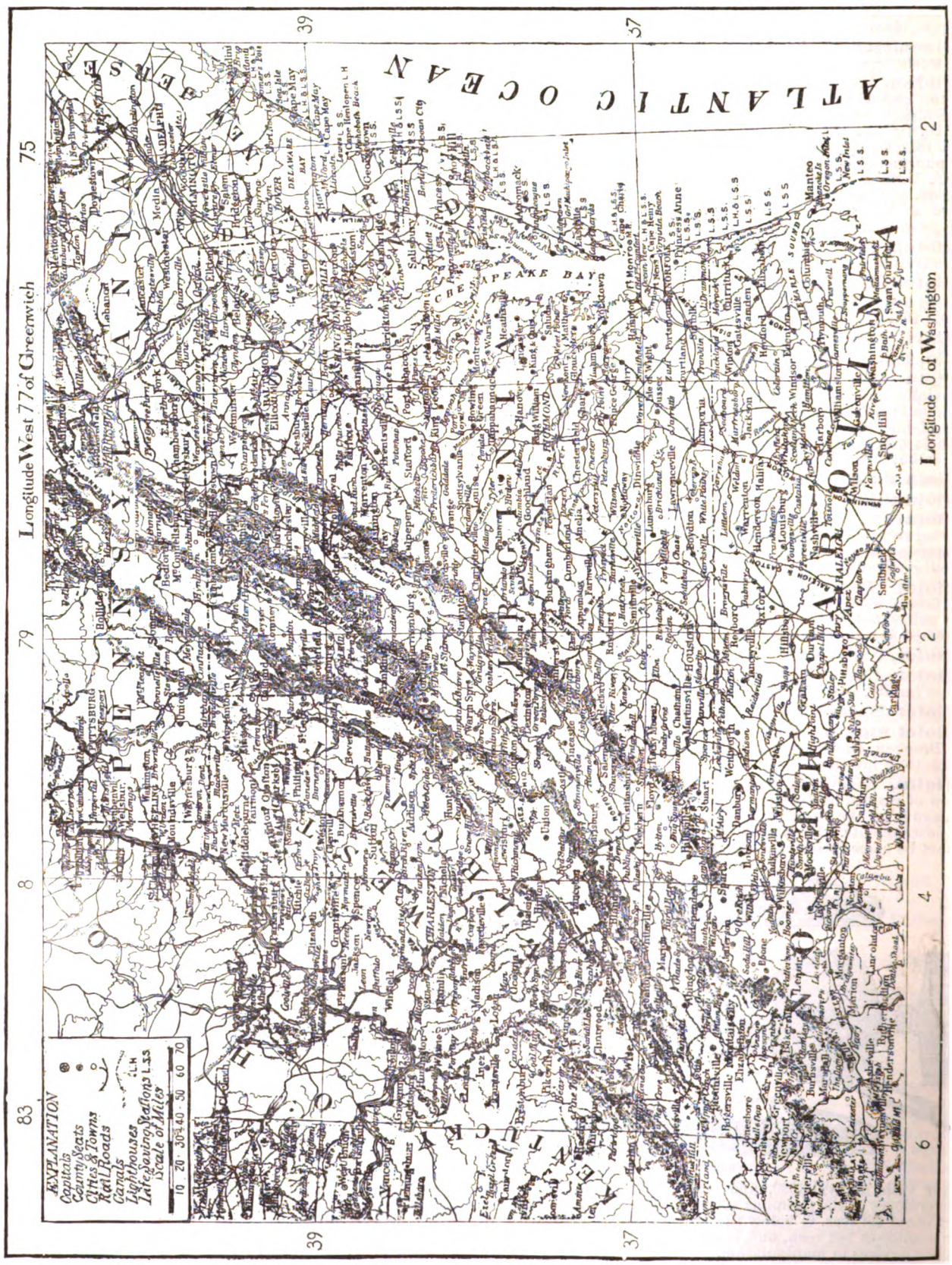
Virchow, RUDOLF, b.1821. Prof. of Pathology at Würzburg 1849, and Berlin since 1856; father of the cellular theory; member Prussian Diet 1862; political liberal and sanitary reformer. *Cellular Pathology*, 1850, tr. 1860; *Famine Fever*, tr. 1868; *Freedom of Science*, tr. 1878.

Viret, PIERRE, 1511–1571. Swiss reformer and theological writer.

Virgil, or PUBLIUS VERGILIUS MARO, 70–19 B.C. Greatest of Latin poets; born near Mantua, educated at Rome. When the empire was established, he became a friend of Mæcenas and Augustus, and enjoyed the companionship of the literary men of the Golden Age. Besides several poems that have been attributed to him with some doubtfulness, we possess the ten *Eclogues* or *Bucolics*, pastoral poems in imitation of Theocritus; the *Georgics*, in four books, a didactic poem upon agriculture, considered his most finished work; and the *Æneid*, an epic in twelve books, which recounts the adventures of Æneas, the mythical ancestor of the Julian family, from the taking of Troy until the defeat and death of Turnus in Latium. The perfection of its hexameter verse, beauty of its descriptions, and general interest of the action, have given the *Æneid* a high place in the world's literature.

Virginal. Musical instrument with keyboard, one of the precursors of the pianoforte.

Virginia. One of the e. States. Its area is 42,450 sq. m. The e. part is low and level, and contains much alluvial and marshy land. Further back the country rises, gradually becoming more broken until the Blue Ridge is reached, which within the State has an elevation of from 1,300 to over 5,000 ft. Beyond the Blue Ridge succeeds the great Appalachian valley, which is here considerably broken by parallel ridges. The line separating V. from W. Va. follows approximately the ridges which limit this valley on the w. It has numerous rivers, flowing from the Blue Ridge s.e. to the Atlantic. The larger


Longitude West 77 of Greenwich
Longitude 0 of Washington
ATLANTIC OCEAN
CHESAPEAKE BAY
DELAWARE BAY
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lighthouses
Life Saving Stations L.S.S.
Scale of Miles
10 20 30 40 50 60 70

of these, as the Potomac, Rappahannock, and James, are tidal and navigable to the Fall Line; *i.e.*, the line between the Archæan and the Cretaceous formations, where the rivers of the Atlantic slope generally have falls or rapids. A geological section across the State, running n.w. and s.e., characterizes the distribution of formations. The Appalachian valley shows an alternation of Silurian and Devonian rocks. With the Blue Ridge the Archæan rocks come to the surface and continue e. to the Fall Line, where they are succeeded by Cretaceous, Eocene, and finally Neocene beds, which extend to the coast. The industries of V. are mainly agricultural; the greatest attention is paid to tobacco. The value of farms in 1890 was $254,490,600; of agricultural products, 1889, $42,244,458. Manufactures are by no means as important; they consist of flour, tobacco, lumber, iron and steel. The mileage of railroads in 1896 was 3,605. The capital is Richmond, at the head of navigation and tidewater on the James. V. was one of the 13 original States. It was reduced in area in 1863 by the formation of W. Va. The first permanent English settlement in America was made at Jamestown, May 1607; its shores had been visited 1498 by Sebastian Cabot, and afterward by Sir W. Raleigh, who named it in honor of Queen Elizabeth. The company of English gentlemen which settled at Jamestown was re-enforced or superseded two years later by the London company sent out by the king with a charter granting them 400 miles of seacoast and all the country back "throughout from sea to sea." The colony flourished: in 1619 was organized the first legislative body in N. America. In 1624 James I. deprived the London company of its charter, and V. became a royal province. It took a leading part in the war for independence, and after the formation of the Union furnished four of the first five Presidents. The State capital, Richmond, was the center of the Confederacy during the Civil War. Pop., 1890, 1,655,980, or 39 per sq. m., 640,807 were colored.

Virginia. In Roman Legend, daughter of the Roman centurion Virginius; slain by her father to save her from the lust of the decemvir Appius Claudius; avenged by a revolution; celebrated by Macaulay.

Virginia, UNIVERSITY OF. At Charlottesville; chartered 1819, opened 1825. Jefferson had much to do with its organization, and was its first rector. It consists of 22 separate schools, each under a professor; the students elect their schools or courses. It has received from the State, since 1884, $40,000 annually. It has (1897) 27 instructors in the academic staff, and 29 in the medical, with 504 students in all, of whom 248 are in the department of arts, 119 in law, and 151 in medicine. Summer courses are offered in mathematics, chemistry, and law.

Virginia, WEST. See WEST VIRGINIA.

Virginia City. Capital of Storey co., Nevada; on the side of Mt. Davidson, over the COMSTOCK LODE (q.v.), with which its fortunes are closely connected; founded 1859. Pop., 1890, 8,511.

Virginia Creeper. *Parthenocissus quinquefolia.* High

Virginia Creeper (*Porthenocissus quinquefolia*).

climbing vine of the Grape family, native of the e. U. S., much planted for ornament; called American Ivy. The tendrils terminate in a kind of sucker, it is a rapid grower, and its leaves have a brilliant autumnal coloring.

Virginian Deer (CARIACUS VIRGINIANUS). Species of deer found in all parts of N. America, from Mexico to ab. 45° N. lat. and from the Atlantic to the Pacific Ocean. It grows to be 3 ft. high at the shoulder; the color varies, being light reddish-brown in summer and dull brown in winter, the belly and the inner parts of the limbs being white.

Virginian Snake-root. See SNAKE-ROOT, VIRGINIAN.

Virginia Polytechnic Institute. At Blacksburg, Va. It was opened in 1872; enlarged 1896. It offers seven four-year courses leading to the B S. degree. It has 15 professors, 12 assistants, 24 graduate and 223 undergraduate students; the total enrollment is 335.

Virgin Islands. W. Indian group of ab. 50, mostly very small, e. of Porto Rico. The two largest, St. Thomas and Santa Cruz, with St. John, are Danish; a few are Spanish, the rest British. Total area ab. 245 sq. m.; pop. ab. 45,000.

Virgin's Bower. Vines of the genus *Clematis*, natural family *Ranunculaceæ*, of wide geographical distribution.

Virgo. See ZODIAC.

Virgula. Solid chitinous axis which runs along the dorsal side of the polypary of a Graptolite.

Viriathus, d.140 B.C. Peasant of Lusitania (Portugal and w. Spain), who raised war against the Romans ab.150 B.C., defeated a consular army 141, and secured independence for his region, but was soon treacherously slain.

Viridine. $C_{31}H_{23}N_2SO_3Na$. Dark green powder, produced from the substance obtained by the action of sulphuric acid on an oxidized product of the action of benzyl chloride on diphenylamine.

Viridite. Greenish products of alteration often seen in rock sections when studied under the microscope; and probably of a chloritic or serpentinous character; so named by Vogelsang.

Virtual Image. See FOCUS.

Virtual Moment. See VIRTUAL VELOCITY.

Virtual Temperature. Absolute temperature that would have to be given to a unit volume of dry air in order to bring it to the same density that a unit volume of given ordinary moist air has, both being under a common pressure; so named 1876 by Guldberg and Mohn.

Virtual Velocity, or VIRTUAL WORK. Component of the displacement in the direction in which the force acts, if the point of its application be displaced through a small distance Δs. This is positive or negative according as it is in the same or in the opposite direction to that of the force. The product of the force into the virtual velocity of its point of application is called by Duhamel its virtual moment. The principle of virtual velocities is applied to the solution of many problems in statics, and may be thus enunciated: If any material system be in equilibrium, and if we conceive a displacement of all its parts, which is consistent with the conditions to which they are subject, the sum of the virtual moments of all the forces is zero, whatever be the displacement; and conversely, if this relation hold for all the virtual displacements, the system is in equilibrium.

Virtue. Habit of mind by which duties are performed, accompanied by a disposition toward their performance, and moved by a love of right.

Virus. Originally the specific contagious material obtained in cowpox and used for vaccination, and then the specific contagium of any infectious disease. It has now a wider signification, being applied to any poison causing a morbid process, including pathogenic microbes.

Viscellinus, SPURIUS CASSIUS, d.485 B.C. In Roman Legend, thrice consul; author of an alliance with the Hernici of Campania, dangerous foes of Rome, and of the first agrarian law. Patrician jealousy of this law caused his death by execution.

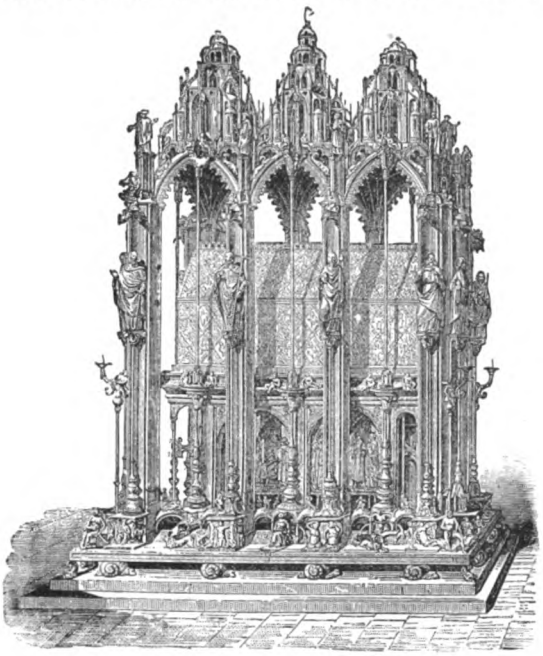
Visceral Arches AND **Clefts.** See BRANCHIAL ARCHES and BRANCHIAL APERTURES or CLEFTS.

Visceral Hump. Great dorsal development of Gastropod mollusks, which contains the generative organs, liver, etc., and occupies the upper turns of the shell, usually spirally wound.

Vischer, FRIEDRICH THEODOR, 1807–1887. Prof. Tübingen 1837, Zurich 1855, and Stuttgart 1866; essayist and critic of

high rank. *Æsthetik*, 4 vols., 1846–57; *Kritische Gänge*, 7 vols., 1846–66. He pub. also poems, and a novel, *Auch Einer*, 1879.

Vischer, PETER, 1455–1529. German artist in bronze, famous for St. Sebald's tomb in Nuremberg, a relief in the cathedral at Ratisbon, and others in or near Bavaria, and



St. Sebald's Tomb at Nuremberg, by Vischer.

in virtue of these he was reckoned by contemporaries as next to Albert Durer. Little is known of his life. His sons were also distinguished as sculptors and workers in bronze.

Viscidity. Property of a viscous fluid in virtue of which it can, like melted glass, be drawn out into fine threads; *e.g.*, fluid from which a spider spins his web.

Visconti. Lombard house, long supreme in Milan. OTTONE, or OTHO, 1208–1295, became Abp. 1263: his nephew, MATTEO, 1250–1322, was Viscount 1311–22.—GALEAZZO I., 1277–1328, formed an imperial alliance and defeated a papal army.—GALEAZZO II., 1320–1378, founded the Univ. of Pavia and patronized Petrarch.—His son, GIAN, 1347–1402, ruled 1378–1402, became Duke, and enlarged his dominions. The male line ended 1447: the Sforzas succeeded.

Visconti, GIAUBATTISTA, 1722–1784. Prefect of antiquities at Rome from 1768; curator of the museum founded by Clement XIV.—His son, ENNIO QUIRINO, 1751–1818, prof. Paris from 1799, pub. *Iconographie Grecque*, 1808, and *Iconographie Romaine*, 1818–20. *Opere tutte*, 21 vols., 1824.—His son, LOUIS TULLIUS JOACHIM, 1791–1853, was an architect in Paris.

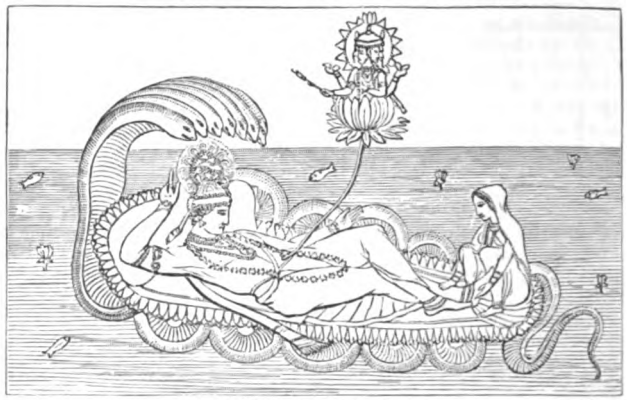
Visconti Venosta, EMILIO, b.1829. Italian Foreign Minister 1863–64, 1866–67, and 1869–76; Senator 1886.

Viscosity. When a fluid is subjected to a deforming force, the strain produced is proportional to the time the force acts. The resistance to this continuous change of form, depending on the velocity of the change, is called viscosity. It varies in amount from that of tar or sealing-wax to that of ether or hydrogen. This term is sometimes applied to an elastic solid, capable of vibrating, to explain the fact that in time the motion ceases, the energy of vibration being converted into heat. This viscosity or imperfect elasticity makes it impracticable to employ lead or zinc in the construction of tuning-forks. Superficial viscosity is the property of the surface films of liquids on account of which frothing may result from agitation, providing the surface tension be not too great. A fluid with infinite viscosity would not differ from a rigid solid (see COEFFICIENT OF VISCOSITY). The discovery of the viscosity of fluids in general is due to Prof. Stokes.

Viscount. In Britain, rank between earl and baron; first bestowed 1440, on John Beaumont.

Vise. Spiral staircase, in the Norman style, with the steps resting upon a continuous spiral vault; subsequently, each step was a single stone, the outer end inserted in the wall, the other end resting upon and forming part of the newel.

Vishnu. Preserver; middle deity of the Hindu Triad. The worship rendered to him in his many avatars or incarnations is the principal form of Hinduism, and is often licentious,



Vishnu as Narayana.

but less gloomy and cruel than that of Siva, the Destroyer. V. is generally represented as a dark-blue man with four arms. His most ardent worshipers are of the middle classes.

Visible Speech. System of symbols designed to represent every possible articulate utterance of the organs of speech. It was devised by Alex. M. Bell and first printed in 1867. The symbols are to a certain extent pictorial of the action of the organs which produce the sound. Consonants are represented by curves which have the outline of the organs they symbolize, and a straight line is the basis of all vowel symbols. With these, the curve and straight line, and their combinations, symbols for all the sounds are made.

Visigoths. See GOTHS.

Vision. Process that permits one to take cognizance of an object through the organ of sight; it involves the transmission of light from the object to the eye, its refraction by the dioptric apparatus of the eye, the exciting of nervous energy by the resulting image, which is conveyed to the brain and is there transformed into a sensation. See SIGHT, SENSATIONS OF.

Vision, DEFECTS OF. Anything that interferes with any factor in the complex process of vision will cause a defect. The media of the eye may not be transparent, there may be disease of the coats of the eye, of the optic nerve, or of the visual centers in the brain, and vision would be deficient for some organic cause; again the dioptric curves may be abnormal, or the muscular apparatus governing either the accommodation or convergence of the eyes may be deficient, and a defect of vision would result from a functional cause.

Vision. In Scripture, presentation, commonly in symbolic form, to the mind of a prophet or seer, of some spiritual truth; usually affecting the sight and hearing, but sometimes only the inner sense.

Visitation, FEAST OF. In R.C. Ch., July 2, commemorating the visit of the Virgin Mary to Elizabeth.

Visitation, NUNS OF THE. Order founded 1610 by St. Francis de Sales and Mme. de Chantal. It became monastic 1618, and spread rapidly, as later in America.

Visitation and Search. See SEARCH.

Visiting Cards. The origin of these can be traced directly in China, where the custom of exchanging cards is universal at New Year. Chinese cards are oblong strips of red paper, inscribed with the name of an individual or shop company. They are carefully preserved and pasted in a conspicuous place in the shop or dwelling through the year, forming a kind of pledge from friend or clansman. It may be inferred from their name that they were originally made of bamboo, and from their resemblance to the message arrow of China that they originated with the latter in the arrow marked with the name or symbol of its owner.

Visp. Village of Vaud, where Swiss peasants defeated the Earl of Savoy 1388.

Vistula. River of Europe, which heads in the Carpathian Mts. of Austro-Hungary, and flows mainly n. across parts of Poland and Prussia to the Gulf of Dantzig, in the Baltic Sea. Length 696 m., drainage area 69,309 sq. m.

Visual Angle. See OPTIC AXIS.

Visualization. Act of calling up a mental picture with such distinctness as to simulate more or less completely an

actual visual percept. Individuals differ greatly in visualizing power, some being able to form such distinct images that they are in effect looking upon the actual object or scene; a few are unable to form any visual image. Nearly every one has the faculty to some extent. See NUMBER FORMS.

Vis Viva. See LIVING FORCE.

Vit, VICENZO DE, 1811–1892. Italian priest, editor of Forcellini's Latin *Lexicon*, 6 vols., 1858–79, and compiler of *Onomasticon*, a list of proper names prior to 400.

Vitaceæ. See AMPELIDACEÆ.

Vitalianus. Pope 657–672. He and Maurus, Abp. of Ravenna, excommunicated each other.

Vitalis, ORDERICUS. 1075–ab.1143. English monk of St. Evroul, Normandy. His *Hist. Ecclesiastica*, extending to 1142, was tr. 1853–56; parts are of value.

Vital Statistics. Statistical information relating to the life history of a collection of individuals, whether an institution, a community, or a nation. It involves the gathering of the facts, their tabulation and certain deductions that may fairly be drawn from the premises furnished. Facts as to birth, marriage, sickness and death are the chief ones sought for. Carefully gathered and properly tabulated, vital statistics are of inestimable value in studying the economic and social condition of a country.

Vitebsk. City of w. Russia, at the junction of the Dwina and Viteba. Pop., 1890, 58,179.

Vitellarium. Special portion of the ovaries of turbellarian worms, insects, etc., which furnishes cells that are wholly transformed into yolk as food for the egg cells.

Vitelline Duct. That leading from the yolk-sac to the embryo in forms that have much food-yolk in the egg, as Reptiles and Birds.

Vitellius, AULUS, 15–69. Eighth Roman emperor; notorious for gluttony; proclaimed Jan. 69 at Cologne by his troops,

Vitellius, from Bust in the Capitoline Museum.

who defeated Otho's but were beaten by those of Vespasian; slain Dec. 21.

Viterbo. Italian town, 42 m. n.w. of Rome, noted for its springs, bishop's palace, and ch. relics. Pop. ab.16,500.

Vitet, LOUIS, 1802–1873. French poet and essayist. *Etudes*, 1864–74.

Vitiligo. Disease of the skin characterized by a deficiency of pigment, causing a well-defined white patch, of which there may be one or many. If on the hairy parts of the body, the hair also becomes white or drops out.

Vitreous. See ELECTRIFICATION.

Vitreous Copper. Chalcocite, Cu_2S.

Vitreous Silver. Argentite, Ag_2S.

Vitrification. Conversion of a material into another having a glassy or vitreous structure. It is assisted by alkalies and heat.

Vitrified Forts. Prehistoric fortifications found in Scotland, built of siliceous stones, which have the inside and in some cases the entire fort vitrified by means of fire and wood ashes.

Vitringa, CAMPEGIUS, 1659–1722. Dutch theologian and voluminous Latin writer; prof. Franeker from 1683. His commentary on Isaiah, 1714–20, is still valued.

Vitriols. Hydrous metallic sulphates. Some of the vitriols are found in nature in small quantity as products of the alteration of metalliferous minerals, as copper vitriol, chalcanthite, $CuSO_4+5H_2O$; iron vitriol, melanterite, $FeSO_4+7H_2O$; zinc vitriol, goslarite, $ZnSO_4+7H_2O$.

Vitruvian Scroll. Scroll work of convolved undulations, used in Classical Architecture.

Vitruvius, POLLIO, 1st cent. B.C. Latin writer on architecture. His work was tr. 1771–91 and 1826.

Vittæ. Oil-tubes of the fruit of the *Umbelliferæ*.

Vittoria. Town of e. Sicily; site of a defeat of Arabs by Roger I. 1092.

Vittoria. Town of n. Spain; site of Wellington's victory over the French commanded by Joseph Bonaparte and Mar-

Vittoria.

shal Jourdan, June 21, 1813. Ab.75,000 were on each side. Jourdan lost all his artillery.

Vittoria, ALESSANDRO, 1525–1608. Italian architect.

Vittoria, TOMASO LUDOVICO DA. ab.1540–1608. Spanish ch. composer; colleague and friend of Palestrina.

Vitus, ST. Sicilian martyr ab.300; patron of dancers and actors; invoked by German peasants to cure the nervous disease named from him, and to insure health in general. His day is June 15.

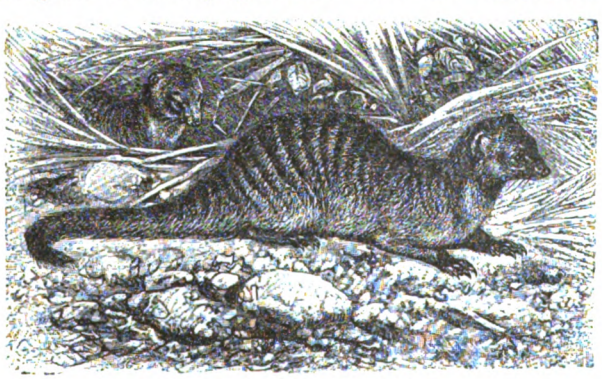
Vivaldi, ANTONIO, d.1743. Italian violinist. His most important compositions are those for violin, but he also wrote 29 operas, chiefly for Venice, where he was director of the Conservatorio della Pietà. J. S. Bach transcribed some of his violin concertos for clavier and organ.

Vivanco, MANUEL IGNACIO DE, 1806–1873. Peruvian revolutionist, in power 1843.

Vivandiere. Woman sutler, chiefly in French marching regiments; celebrated in Ouida's and other novels.

Vivarini, ANTONIO, d.1470, and BARTOLOMMEO, d. ab.1500. Venetian painters.

Viverridæ. Family of *Æluroidea*, having sharp muzzles, long tails, spotted or banded marks in the fur, and a semiplantigrade mode of progression. There are four premolars



Zebra Mongoos (*Herpestes fasciatus*).

and two tuberculated molars in each series. Here belong the Civet cats, noted for the musky secretion of their anal glands, used as a pomade. The Genet is a variety domesticated in Europe, having rudimentary scent-glands. Allied is the Ich-

neumon (*Herpestes*), domesticated in Egypt, which lives on snakes, lizards, crocodile eggs, etc., and the Mongoos of India, celebrated for killing poisonous snakes. The *Cryptoprocta* of Madagascar belongs to a special subfamily, as does *Proteles*, the Aard-wolf of S. Africa, about as large as a fox, with feet as in dogs, a body like the hyena, and dentition truly viverrine.

Vives, JUAN LUIS, 1492–1540. Spanish humanist, tutor to Princess Mary of England 1523–28; teacher at Bruges from 1529; Latin writer on Aristotle, Virgil, and St. Augustine. *Linguæ Latinæ Exercitatio*, 1539. *Works*, 8 vols., 1782.

Viviani, DOMENICO, 1772–1840. Prof. of Botany in Genoa. *Annali di Botanica*, 1802; *Floræ Corsicæ*, 1824–30.

Vivianite. $Fe_3P_2O_8+8H_2O$. Hydrous mineral, sometimes called blue iron earth, containing iron and phosphorus; product of mineral alteration, and, when associated with iron ores, an objectionable impurity on account of the phosphorus.

Vivien de St. Martin, LOUIS, 1802–1897. French writer on geography and history.

Vivier, JACQUES DU, 1720–1793. French botanist, long in Peru. *Nova genera et species plantarum*, 1788–90; *Sertum Peruvinum*, 1792.

Viviparous. 1. Giving birth to developed young; as opposed to OVIPAROUS (q.v.). All animals reproduce by means of eggs which, in viviparous forms, hatch within the mother. 2. Plants whose seeds or bulblets begin to grow before separation from the parent plant.

Vivisection. In Physiology, the employment of living animals to assist in solving problems relating to the performance of the normal functions of an organ, the nature and effects of diseased conditions, or the effects of remedies. Animal experimentation has aided in making many valuable discoveries for the benefit of mankind.

Vizcaino, SEBASTIAN, ab.1550–1615. Spanish seaman, who explored the coast of California and Oregon 1602–3, and went to the Philippines and Japan 1610.

Vizier. Mohammedan dignitary; usually, since 752, chief minister of a sovereign. The Grand Vizier was head of the Sultan's councilors 1327–1878.

Vladikavkaz. Russian town, n. of the Caucasus, commanding the pass s. to Tiflis. Pop., 1892, 46,345.

Vladimir. Old town of Russia, 120 m. n.e. of Moscow. Its Kremlin and Golden Gate date from ab.1150–60. Pop. 18,305.

Vladivostok. Town of s.e. Siberia, on the Japan Sea; founded 1861. It has a fine harbor, and is of naval importance. Pop. ab. 15,000.

Vocal Music. Generally, all music written to be sung by the human voice; strictly, it does not include mixed forms, as songs, cantatas, oratorios, masses, and operas, in which the voices are accompanied by instruments. Its most perfect type is the so-called a capella music of the church, which reached its culmination in Palestrina.

Voclupiaceæ. Natural order of flowering plants, of the class *Angiospermæ*, subclass *Dicotyledons*, and series *Polypetalæ*, comprising 7 genera and ab. 130 species, distributed through the tropical regions of America as far as Panama.

Voetius, GYSBERTUS, 1588–1676. Prof. Utrecht 1634; severe theologian, who wrote much against the Arminians or Remonstrants.

Vogdes, ISRAEL, U.S.A., 1816–1889. Brig.-gen. U. S. Vols. 1862–66, serving in Fla., S. C., and Va.

Vogel, ALFRED, 1829–1890. Prof. Dorpat 1866, and Munich 1886; writer on pathology. *Kinderkrankheiten*, 1860.

Vogel, EDUARD, 1829–1856. German explorer in n. central Africa from 1853; murdered in Wadai.

Vogel, JULIUS, b.1835. English official in Australia 1852–69, and New Zealand 1869–88.

Vogelweide. See WALTHER UM WOGELWEIDE.

Voghera. Ancient town of n.w. Italy, 16 m. s.w. of Pavia. Pop. ab.13,000.

Vogler, GEORG JOSEPH, 1749–1814. German musician and teacher, celebrated in one of Browning's noblest poems, *Abt Vogler*, 1864. He elaborated a new system of fingering, contrived to learn the violin and other instruments without a teacher, and founded schools of music at Mannheim, Stockholm and Darmstadt. Weber and Myerbeer were among his pupils. He excelled in the department of harmony.

Georg Joseph Vogler.

Vogt, CARL, 1817–1895. Prof. of Geology at Geneva from 1852. *Lectures on Man*, tr. 1864.

Vogüé, CHARLES JEAN MELCHIOR, MARQUIS DE, b.1829. French Orientalist; Academician 1868; envoy to Turkey 1871, and to Austria 1873.—His relative, EUGENE MARIE MELCHIOR, VICOMTE, b.1848, is prominent as a critic and in the Neo-Christian movement. *Le Roman Russe*, 1886; *Russian Portraits*, tr. 1896.

Vogué, JEAN PIERRE DE, 1570–1630. Flemish soldier, treasure-hunter in the wilds of Brazil.

Voice. Appreciable sound produced by the air, when driven from the lungs, throwing the inferior ligaments of the glottis into vibration. See SINGING, SOUND, and TIMBRE.

Voice, LOSS OF. See APHONIA.

Voight, FRIEDRICH SIEGMUND, 1781–1850. Prof. Jena. *Botanischen Kunstsprache*, 1803; *Praktischen Botanik*, 1850.

Voir Dire. Preliminary examination of a proposed witness to determine his competency.

Voisin, FRANÇOIS PHILIPPE, b.1821. French engineer, director Suez Canal 1861–70; prof. Paris 1873–81. *Ports de Mer*, 1883; *Travaux à l'Embouchure du Danube*, 1893.

Voisin, PIERRE JOSEPH, 1759–1821. French writer on Guiana.

Voiture, NICOLAS AUGUSTE, ab.1764–1821. Chilian-French writer on Patagonia 1812–14; literary historian of S. America 1818.

Voiture, VINCENT, 1598–1648. French author of lyrics and epistles. *Works*, 1650; *Lettres*, 1880.

Vokes, ROSINA (MRS. C. CLAY), 1854–1894. English actress, often in the U. S.

Volapük. Universal language, invented 1879 by J. M. Schleyer, a German priest of Baden. It has 37 letters, each having always the same sound. It is simple and uniform in structure and arrangement, and easily learned. A grammar and dictionary were pub. 1880. It has been used in many books. Though received with some enthusiasm at first, interest in it seems to have declined.

Volatile Oils. Vegetable oils which boil without decomposition, as oil of turpentine. They may be hydrocarbons or compounds of more complicated nature.

Volcano. To the modern geologist, opening extending down into the earth and providing a way for the escape of molten and gaseous matter from below. The outbreak is in all probability caused by the access to heated rock of water, which, being suddenly converted into steam, develops enormous explosive force and produces an eruption. The lava forced up from below soon opens a way through the porous side of the crater and flows down, while vast quantities of the same material are violently blown from the crater, and, being

thereby reduced to powder, produce the volcanic dust, the heavier part of which falls again on and near the crater, while the lighter portion rises and floats away in the higher regions of the atmosphere, where much of it probably remains for months or even years. The volcano consequently builds up for itself a cone of the material thrown out of the crater, and forms a mountain of eruption. The study of volcanic lavas has thrown great light on the history of the primitive rocks of the globe, and the results of furnace experiments have in turn elucidated the formation of lavas by showing most of the volcanic products in their slags. The smoke often said to attend a volcanic eruption, is mostly the dust. The flame is chiefly the glare of the lava in the crater, reflected from the clouds, and the rain is in part at least due to the condensation of erupted steam. Some of the most remarkable outbreaks on record are the following: those of Ætna from time immemorial, and of Vesuvius since 79; that at Tomboro in Sumbawa 1815, when nearly the whole population of the island was destroyed and the explosions were heard 1,000 m. away; the great eruption of the Skapta Jokul, in Iceland, 1783, when 10,000 persons and immense numbers of cattle perished and a thick haze overhung w. Europe for some months; that of Jorullo in Mexico, 1759, when a volcano was suddenly elevated to a height of 16,000 ft. in the midst of a vast plain previously covered with fertile fields of sugar-cane and indigo; that of Galung-Gung, in Java, 1822, when, in the midst of a dense forest in a fruitful and thickly peopled region, immense torrents of boiling water and mud were poured forth until in five hours not a trace of the villages and plantations remained. More recent still is the tremendous eruption of Krakatoa, in the same region, 1883, the details of which are yet fresh in the memory. The report of the committee sent out by the Royal Society of London forms a valuable and permanent record of this outbreak, the concussion of which was traced by the barometer three times round the globe before it died out, and the sunset glows produced by the dust were brilliant for months. The destruction of the pink and white terraces of Rotarua, New Zealand, 1886, and the eruption of the Mud Volcano of Bandaisan in Japan 1895, are among the most recent illustrations of volcanic action. Whymper estimated that in the eruption of Cotopaxi in 1880 2,000,000 tons of dust were discharged into the atmosphere. It was of an ashen color and consisted of fragments of lava and feldspar; the smallest particles were $\frac{1}{25000}$ of an inch in diameter.

Voles. Rodents of the subfamily *Arvicolinæ*, of section MYOMORPHA (q.v.). In America they are called Field and Meadow Mice. Many species are included. They range from the Arctic regions to Texas, living in burrows in low, moist

Water Vole (*Arvicola amphibius*).

lands; some species are aquatic. They are small, not exceeding 5 in. in length, but very prolific, and destructive to grain and crops. They differ from mice in having short blunt muzzle, short limbs and tail, and low, nearly hidden ears.

Volga. Longest river in Europe. It heads in the Ural Mts. and the plains of central Russia, and flows into the Caspian Sea through an extensive delta. Length 2,330 m., drainage area 517,272 sq. m. It is of vast commercial importance, being navigable, except in winter, through nearly its entire course, as are many of its tributaries.

Volition. Active aspect of consciousness. It is commensurate with COGNITION and FEELING (q.v.) and interdependent with them. Every state of consciousness involves a volitional or conative element. Volition is based on impulse, and is itself impulse regulated and directed toward a recognized end, this end being felt as desirable. It follows then that volition or will involves knowledge and feeling: there must be knowledge of the end and the end must involve an emotional element with consequent interest. In a concrete volitional act, then, we have a state of desire followed by determination and choice between competing desires, and these become the motive of the action. If the action be unimpeded the will may be said to be free. See WILL.

Volk, LEONARD WELLS, 1828–1895. Sculptor of Chicago. His works are chiefly portrait-busts. — His son, STEPHEN ARNOLD DOUGLAS, b.1856, is a sculptor in Minneapolis.

Volkelt, JOHANNES, b.1848. Prof. Basel 1883, Würzburg 1889, and Leipzig 1894; writer on philosophy and pedagogy.

Volkmann, FRIEDRICH ROBERT, 1815–1883. Prof. of Harmony and Counterpoint at Pesth 1858; composer of two symphonies, D minor and B-flat major, three serenades for string orchestra, of which one in D minor with violoncello obbligato is much liked in the U. S., six string quartets, two overtures, and many miscellaneous pieces.

Volkslieder. German popular songs, 1300–1600.

Vollenhove. Town of Overyssel, on the Zuyder Zee, 12 m. n.w. of Zwolle. Here the Frisians defeated Rheinhold of Guelders 1323. Pop. 1,543.

Vollon, ANTOINE, b.1833. French painter, eminent especially as a colorist.

Volney, CONSTANTIN FRANÇOIS CHASSEBŒUF (BOISGIRAIS), COMTE DE, 1757–1820. Last of the French philosophes; Deputy 1789. His famous *Ruins*, 1791, brilliant, cynical, and anti-religious, was extracted from *Voyage in Egypte et en Syrie*, 1787. Though a republican, he narrowly escaped the guillotine. In 1794 he befriended Bonaparte, and while in the U. S., 1795–99, predicted the successive steps of his Italian campaign. He became Senator 1799, Academician 1803, Count 1808, and Peer 1814. *Tableau du Climat et du Sol*, 1803. *Works*, 8 vols., 1820–26.

Volsci. Italian tribe s.e. of Rome, long its enemies; conquered and made citizens ab.338 B.C.

Volscian Language. That of the Volscians, related to the Umbrian.

Volsinii. Ancient name for Bolsena, a town of Italy ab. 20 m. n.w. of Viterbo. It was the capital of the Volsci, and taken by the Romans 280 B.C. Pop. ab. 3,000.

Volsk. Town of e. Russia, on the Volga, 70 m. n.e. of Saratoff. Pop., 1890, 39,995.

Volsungs. Legendary race sprung from a grandson of Odin; celebrated in sagas.

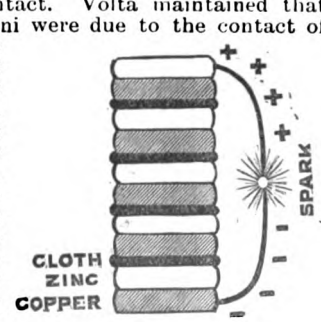
Volt. Practical unit of difference of electrical potential or electromotive force; named for Volta. It is equal to 10^8 C.G.S. electromagnetic units. A megavolt is 1,000,000 volts; microvolt is one millionth of a volt. The electromotive force of a Daniell's cell is about one volt.

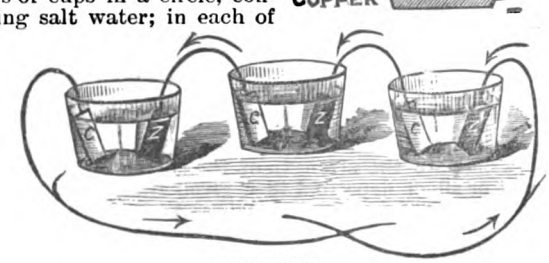
Volta, ALESSANDRO, 1745–1827. Prof. of Natural Philosophy at Pavia 1774–1804; pioneer electrician; inventor of the Voltaic pile; made count and senator by Bonaparte. *Works*, 5 vols., 1816.

Volta, LAW OF. Whenever two substances at the same temperature are brought in contact, a finite difference of potential is established between them, independent of their dimensions, form, extent of the surfaces in contact, and absolute value of the potential upon either of them, and dependent only upon the chemical or physical characters of the substances and the medium in which they are immersed.

Voltaic Arc. See ELECTRIC ARC.

Voltaic Pile. Apparatus contrived 1800 for producing electrification by metallic contact. Volta maintained that the effects observed by Galvani were due to the contact of two metals; his pile consists of an alternating series of disks of copper, zinc and wet cloth, many times repeated. If the lower copper and the upper zinc of a considerable series be connected by a wire, a small spark may be observed at the terminals. This experiment excited great interest. Volta described soon afterward the "crown of cups" or series of cups in a circle, containing salt water; in each of





Voltaic Pile.

these was immersed a plate of copper and one of zinc, the copper of each cup being joined with the zinc of the next,

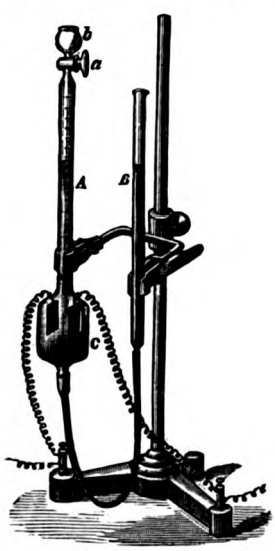
except at the ends. The difference of potential developed at the terminals in both these cases is proportional to the number of pairs. See RITTER'S PILE.

Voltaire, FRANÇOIS MARIE AROUET, 1694–1778. French philosopher, poet, dramatist, critic, essayist, letter-writer, and novelist. His most noted work of fiction is *Candide*, 1759; of history, *Charles XII.*, 1731. Among his tragedies *Zaïre*, 1732, and *Mérope*, 1743, were most highly regarded. His mock-heroic poem, *La Pucelle*, 1730–39, is a travesty of everything sacred: the *Henriade*, 1728, is in another vein. His correspondence is most voluminous, and universal in its topics. He was the acknowledged head of European literature in his later years, and wielded enormous influence, which he used nobly in defense of freedom, as in the cases of Calas and Sirven. His character was a strange mixture of virtues and vices: his hatred of priests, of supernaturalism, and apparently of all forms of visible religion, freely displayed in his *Dict. philosophique*, 1764, and elsewhere, and formulated in the watchword, *Écrasez l'infame*, earned much posthumous no less than contemporary obloquy. He was imprisoned 1716–17 and 1726, in England 1726–29, at Cirey in Champagne 1734–49, in Russia 1750–53, and at Ferney near Geneva from 1758, till shortly before his death, when he received an almost idolatrous ovation in Paris.

Bust of Voltaire, by Houdon.

Voltameter. Instrument for measuring the strength of an electric current by means of certain electrolytic effects which it produces. If the current be passed through acidulated water between two platinum electrodes so arranged that the gases resulting from the decomposition of the water are collected and measured, the current strength is proportional

Voltameter.



Classen's Voltameter.

to the quantity of the gases set free. Copper and silver voltameters indicate the strength of the current by the amount of copper or silver deposited in a given time from a solution of copper sulphate or silver nitrate. According to Rayleigh, a current of one ampere sets free 0.000010352 gram of hydrogen, and 0.001118 gram of silver per second.

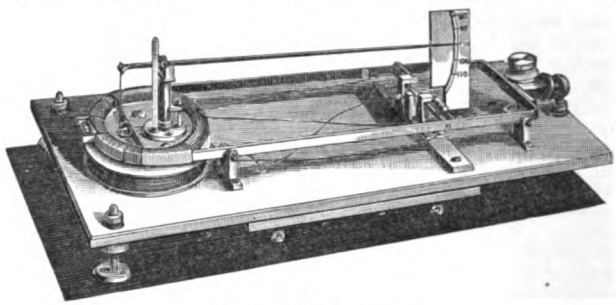
Volt-Ampere. See WATT.

Volt-Coulomb. See JOULE.

Volterra. Italian town, 35 m. s.w. of Pisa; notable for its Etruscan antiquities. Pop. ab. 7,000.

Volterra, DANIELE DA, 1509–1566. Italian painter, employed to drape the nude figures in Michelangelo's *Last Judgment*. His fine fresco of the *Descent from the Cross* is in Trinità de' Monti, Rome.

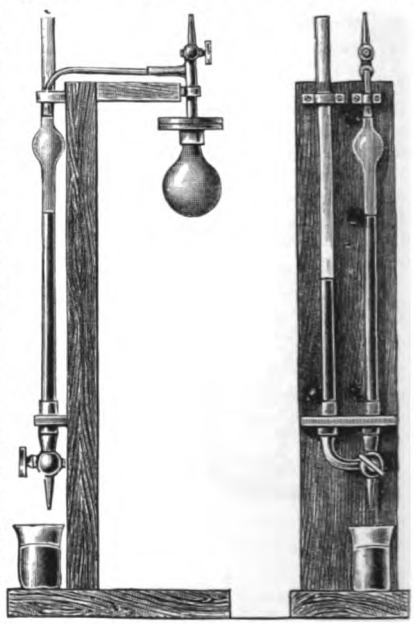
Voltmeter. Instrument for determining the electromotive difference of potential between two points of an electric circuit. The indications are given directly in volts by an in-


Thomson's Voltmeter.

dex which moves over an empirically graduated scale. Voltmeters have been devised by Thomson, Ayrton and Perry, Deprez, and Carpentier.

Volume. Limited space in three dimensions, as subject to measurement, or result of such measure. The primary unit of volume is a cube whose edge is a linear unit.

Volumenometer, VOLUMOMETER, or STEREOMETER. Instrument for measuring volumes; *e.g.*, that of an irregular solid. It consists of two glass tubes placed vertically against two scales. The tubes are joined at the bottom by a pipe with a tap in it. One of them is open at the top; the top of the other is bent at right angles, and to it is attached a small spherical flask; at the bottom of this tube is a second tap. The tubes are partly filled with mercury, the height of which may be regulated by the taps at the bottom. The volume of the flask and that of the tube down to a certain mark must first be found, then, by introducing the solid into the flask and repeating the experiment, the volume of the solid is known. This method is applicable for finding the true volume of the material of a porous substance, as a piece of wood; thus the real density of wood may be found. This instrument may be used also for experimentally verifying the law of Boyle.


Volumenometer.

Volumetric Analysis. Branch of quantitative chemical analysis, in which the quantity of a constituent present in a compound is found by running in a known amount of some substance, in form of a standardized solution, which will convert the constituent into some other form. The end of the reaction is usually shown by a change in color or the deposition of a precipitate.

Voluntary Conveyance. Transfer of property without a valuable consideration. It may be set aside as fraudulent against creditors of the grantor.

Voluntaryism. Separation of Ch. and State, and support of clergy and services by free-will offerings of their adherents; system prevalent in the U. S., and urged or desired by British Nonconformists.

Volunteers. Term applied to a portion of the military forces of the U. S. employed during the Civil War; so called

because they engage in military service by voluntary consent, as shown by their contracts of enlistment. Volunteers differ from the militia, in that they can be called into service for a longer period than nine months, to which the service of the militia is limited by law; they differ from the regular army in that they are employed for a definite period, and do not form a part of the permanent military establishment. It has been the practice of the U. S. to permit the Governors of States to appoint the commissioned officers of volunteers, instead of having the President exercise this duty, as in the case of regular officers; in this respect volunteers are assimilated to the militia force, from which they are drawn. The aggregate volunteer force called for in the Civil War, counting in it the various militia forces, amounted to 2,763,760 men; the number furnished by the loyal States and Territories was 2,772,408; in addition, there were 86,724 who paid commutation and were exempted. The aggregate employed, reduced to a three years' service standard, was 2,320,272 men.

Volunteers of America. Organization, similar to the Salvation Army, inaugurated under Commander and Mrs. Ballington Booth, March 9, 1896. It had, Dec. 1, 1896, 170 officered posts, 600 commanding officers, 8 regiments of 16 battalions, and 150 staff officers. Its weekly paper had a circulation of 20,000 and its monthly paper of 10,000 copies.

Volusenus. See WILSON, FLORENCE.

Volute. Spiral scroll, characteristic of the Ionic capital; also used in the Corinthian and Composite orders, and frequently retained in the Norman capitals. In the 13th century it takes the form of foliage and is lost.

Volutidæ. See RHACHIGLOSSA.

Volva. Membrane which incloses young toadstools in certain species of *Agaricini*.

Volvocineæ. Order of *Algæ*, including the common *Volvox globator*, and some other species.

Vomer. Bone of the face placed vertically in the nose, forming the bony partition between the nostrils.

Vomiting. Violent expulsion of the contents of the stomach, sometimes also of the upper portion of the intestines, through the mouth. It is usually preceded by nausea, and the process is a complex one, involving the dilation of the opening of the stomach into the gullet, a pressure upon the stomach by the abdominal walls, and an expiratory effort of the lungs. These failing to act in harmony the effort at vomiting results only in retching.

Vomito Negro. Blackish substance, chiefly disorganized blood, vomited in cases of yellow fever; also an acute attack of yellow fever.

Vondel, JOOST VAN DEN, 1587–1679. Dutch lyric and dramatic poet of high rank. Several of his 33 plays are based on Greek models. His *Lucifer*, 1654, may have given Milton hints for *Paradise Lost*.

Voodoo Worship. Secret African orgies, with hideous magical rites, of malignant influence among negroes of Haiti, La., and elsewhere.

Voorhees, DANIEL WOLSEY, 1827–1897. M.C. from Ind. 1861–66 and 1869–73; U. S. Senator from 1877; advocate of greenbacks and free silver.

Vopiscus, FLAVIUS, ab.300. Biographer of the emperors from Aurelian to Carinus, 270–285, in the *Augustan History*.

Voragine, JACOBUS DE. See GOLDEN LEGEND.

Voronej. Town of s. central Russia, on the Voronej, near the Don. It has a good trade. Pop., 1892, 56,403.

Vorosmarty, MIHALY, 1800–1855. Hungarian dramatist and poet. *Solomon*, 1821; *Kant*, 1825; *Eger*, 1827.

Vorstius, CONRAD, 1569–1622. German Arminian divine, prof. Leyden 1610–12; condemned at Dort 1619.

Vortex Ring. See MATTER.

Vorticella. Bell-shaped Infusorian of the group *Peritricha*. It is usually fastened to a retractile stalk, and in the related genus *Zoothamnium* forms extensive colonies. It is very common, is known as the bell animalcule, and is easily studied with moderate magnification.

Vortigern. British prince who is said to have invited the Saxons into Britain to help him against the Picts. They, however, soon became more dangerous than the Picts

Vos, CORNELIS DE, 1585–1651. Flemish painter of distinction, especially in portraits and religious pieces. A fine example is

Abraham Grapheus, by C. Vos.

in the Metropolitan Museum of New York.—His brother, PAUL, 1590–1678, was a painter of animals, and hunting scenes.

Vos, GEERHARDUS, D.D., b.1862 in Holland. Prof. Princeton 1894; theological writer.

Vos, MARTIN DE, 1530–1603. Flemish painter.

Vose, GEORGE LEONARD, b.1831. Prof. Bowdoin 1872, and Mass. Institute of Technology 1881–86; writer on engineering.

Vosges Mts. Range in e. France and Alsace: greatest elevation 4,700 ft.

Vosmaer, CAREL, 1826–1888. Dutch poet and writer on art. *Rembrandt*, 1868–77; *Franz Hals*, 1874; tr. Homer, 1878–88; *Amazone*, 1880, tr. 1884.

Voss, JOHANN HEINRICH, 1751–1826. Prof. Heidelberg 1805; translator of Shakespeare, 1818–29, and of sundry Greek and Latin poets, and most memorably of Homer, 1793; engaged in sundry controversies, as in *Antisymbolik*, 1824–26. His best poem is *Luise*, 1795.

Vossius, GERARD JAN, 1577–1649. Prof. Leyden 1615, Amsterdam 1632; famous for learning. *Hist. Pelagiana*, 1618; *Ars Rhetorica*, 1623; *Aristarchus*, 1635; *Etymologicum Linguæ Latinæ*, 1662.—His son, ISAAC, 1618–1689, was in Sweden 1648–58, and in England from 1670. He wrote on classical subjects, and ed. *Catullus* and several epistles of Ignatius.

Vote. Will of a member of a body, formally manifested toward the decision of a question by the body as a whole, is his vote; and the aggregate expressions of the will of the members is the vote of the body. See BALLOT.

Voting-Machine. Device which mechanically records votes and also counts them automatically. Its chief advantages are: secrecy, as the ballot cannot be identified; simplicity of voting and of counting votes; impossibility of repeating; rapidity; cheapness; and impossibility of fraud in counting. Their use was legalized in N. Y. in 1892, Mass. and Mich. in 1893, and Conn. in 1895. Advocates of the Australian secret ballot have indorsed this method of voting.

Voucher. 1. Obsolete legal proceeding in an action to recover land. 2. Writing showing the payment of money.

Vouet, SIMON, 1590–1649. French painter of portraits and religious subjects.

Voussoir. Wedge-shaped stones of which an arch is constructed. The crown of the arch is the keystone; the lowest, immediately above the impost, is the springer or springing-stone.

Vowels. See PHONETICS.

Vows. Promises to devote one's life or belongings, or any part thereof, to God; familiar from remote antiquity, under motives of gratitude, fear, or hope; admitted and largely employed by R.C. Ch., especially with religious orders.

Voysey, CHARLES, b.1828. English vicar, tried for heresy 1869, deprived of his living 1871.

Vries, ADRIAAN DE, 1601–1643. Dutch portrait painter.

Vriese, WILLEM HENDRICK DE, 1807–1862. Prof. of Botany in Leyden. *Plantenkunde voor Apothekers en Artsen*, 1835–38; *Hortus Spaarn-Bergensis*, 1839; *Agave Americana*, 1847; *De Kinaboom mit Zuid-America*, 1855; *Tuinbouw-Flora van Nederland*, 1855–56.

Vroom, PETER DUMONT, LL.D., 1791–1873. Gov. of N. J. 1829–31 and 1833–36; M.C. 1839–41; U. S. Minister to Prussia 1853–57. His *Reports of N. J. Supreme Court*, 1866–73, were continued by his son, GARRET DORSET WALL, b.1843.

Vug. Small cavity in a mineral vein, lined with crystals; resembling a GEODE (q.v.) in general appearance, though formed under different conditions.

Vuillefoy, DOMINIQUE FELIX DE, b.1841. French painter.

Vulcan. Roman god of fire, identified by poets with the Greek Hephæstus.

Vulcan. Hypothetical planet, believed by Leverrier to revolve about the sun within the orbit of Mercury.

Vulcanite. See CAOUTCHOUC and EBONITE.

Vulcanology. Science which considers volcanoes. This, like Seismology, has been closely studied in Italy and Japan. Its field of work is the volcano, both static and dynamic.

Vulgate. Latin version of the Bible, used in R. C. Ch. The O. T., except the Psalms, was tr. from the Hebrew by St. Jerome 390–405, and in time displaced an earlier rendering: the N. T. he revised from one of unknown origin.

Vulpes. See CYNOIDEA.

Vulpinite. Variety of the mineral ANHYDRATE (q.v.), found at Vulpino in n. Italy. It takes a good polish and is sometimes used for decorative purposes.

Vulpius, CHRISTIAN AUGUST, 1762–1827. German romancer and playwright. *Rinaldo Rinaldini*, 1797.—His sister, JOHANNA CHRISTIANE SOPHIE, 1765–1816, was Goethe's wife from 1806.

Vultures. Large carrion-eating birds of prey. Those of the Old World differ from those in the New in several particulars; thus, the hind toe of the former is on the level with the other toes; the partition between the nostrils is not perforated as in American Vultures; the tarsi are shorter; and they carry food to their young in their claws and not in their beaks. They constitute a subfamily (*Vulturinæ*) of the *Falconidæ*, while the American Vulture forms the family *Cathartidæ*. Examples of the latter are the CONDOR, TURKEY BUZZARD (q.v.), Carrion-crow or Black Vulture, and the King Vulture, which haunts jungles from Mexico to Paraguay, and is white, with the long tail and wing-feathers black, the head lemon and scarlet with orange caruncles. Examples of the former are the Bearded Vulture or LAMMERGEYER (q.v.), and

Bald-Headed Vultures (*Vultur calvus*).

the Egyptian or White Vulture (see PHARAOH'S CHICKENS). Europe has four species, three of which rival the Condor in size. The crested Black Vulture ranges from China through n. Africa. It builds large nests in trees on mountain-tops, where it rears a single young. The Griffon is black, with white tail and wing feathers. Vultures find their food by sight.

Vulturidæ. See VULTURES.

Vyazemski, V. V., PRINCE, d.1892. Russian scholar, philanthropist and ascetic, who freed his serfs 1850, gave them his lands, and anticipated the principles and practices of Count L. N. Tolstoi.

W

Waagen, GUSTAV FRIEDRICH, 1794–1868. Prof. Berlin 1844; art critic. *Kunstwerke und Künstler*, 5 vols., 1837–45; *Treasures of Art*, tr. 1854–57.

Waahoo. See BURNING-BUSH.

Waal. Arm of the Rhine. in s. Gelderland; called the Merwede after its junction with the Maas.

Wabash. Branch of the Ohio, which rises in w. Ohio, flows w., s.w., and s. through Ind., and forms part of the boundary between Ind. and Ill. Length 550 m., drainage area 31,500 sq. m. It is navigable to its forks.

Wabash College. At Crawfordsville, Ind.; opened 1833, chartered 1834. It offers 3 courses, leading to the degrees of A.B., Ph. B., and B.S. Endowment ab. $500,000. Teaching staff 17, students 192, of whom 115 are collegiate; library 33,000 vols. Non-sectarian, but closely affiliated with the Presb. Ch.

Waccama. River of N. and S. Carolina joining the Great Pedee opposite Georgetown, 10 m. from the Atlantic, after a course of 100 m.

Wace, ab.1112–ab.1184. Author of two Norman-French metrical romances, the *Brut* and *Roman de Rou*.

Wace, HENRY, D.D., b.1836. Prof. King's Coll., London, 1875, principal since 1883; preacher at Lincoln's Inn from 1880; joint ed. *Dict. Christian Biography*, 1877–87, and other works. *Foundations of Faith*, 1879; *Evidences*, 1886.

Wachusett Mountain. In Worcester co., Mass. Elevation 2,018 ft.

Wackernagel, JACOB, b.1853. Prof. Basel; writer on philology.

Wackernagel, KARL EDUARD PHILIPP, D.D., 1800–1877. German hymnologist. His *Deutsche Kirchenlied*, 5 vols., 1864–77, is of historical importance.

Waco. Capital of McLennan co., Tex.; on the Brazos; chartered 1850; seat of Baylor Univ. and of two colleges; noted for its artesian wells and exports of cotton. Pop., 1890, 14,445.

Wad. Indefinite mixture of the oxides of several metals, as iron, copper, cobalt, and manganese, occurring in earthy accumulations, and often in quantity to have value as an ore; then known as bog manganese or earthy cobalt. See MANGANESE ORES.

Wadai. Arab state of the Soudan, n. central Africa, w. of Darfur; powerful in n. central Africa. Area ab.150,000 sq. m., pop. ab.3,000,000. Capital Abeshr.

Waddel, JAMES, D.D., 1739–1805. Presb. minister in Va.; noted for eloquence; celebrated by Wm. Wirt as "the blind preacher."

Waddell, JAMES IREDELL, 1824–1886. Confederate naval officer. As commander of the *Shenandoah*, 1864–65, he sunk or burned 32 vessels, chiefly whalers.

Waddell, MOSES, D.D., 1770–1840. Teacher in S. C. 1804; pres. Univ. Ga. 1819–29.—His son, JOHN NEWTON, D.D., LL.D., b.1812, was prof. and pres. of colleges in Miss. and Tenn. up to 1874.

Wadding, LUKE, 1588–1657. Irish historian of the Franciscans; prof. at Salamanca and Rome; editor of *Duns Scotus* 1639. *Annales Ordinis Minorum*, 8 vols., 1626–40.

Waddington, GEORGE, D D., 1793–1869. Dean of Durham 1840. *Hist. Ch.*, 1833; *Hist. Reformation*, 1841.

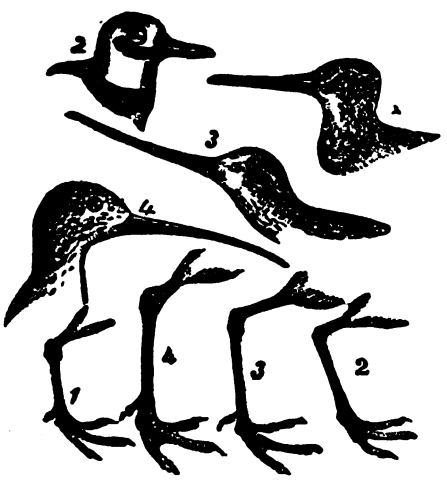
Waddington, WILLIAM HENRY, 1826–1894. French Deputy 1871; of English family and education; Senator 1876–85; Foreign Minister 1876–77; Pres. Council 1879; Envoy to England 1883–92; writer on numismatics and archæology.

Wade, BENJAMIN FRANKLIN, 1800–1878. U. S. Senator from Ohio 1851–69; Republican leader; acting Vice-Pres. 1865; Commissioner to San Domingo 1871.

Wade, GEORGE, 1668–1748. British general, commanding in Scotland 1715–30; maker of roads in the Highlands.

Wade, SIR THOMAS FRANCIS, 1818–1895. English envoy to China 1871; knighted 1875.

Waders. Designation often applied to the whole order of birds *Grallatores*, but really only appropriate to some of them, the more aquatic in their habits, as Herons, Snipes, and Rails. They have long legs and beaks, the latter of different forms, varying with the nature of the food.



Characteristic Features of Waders:
1, Head and foot of Common Snipe; 2, Head and foot of Ringed Dotterel; 3, Head and foot of Common Godwit; 4, Head and foot of Curlew.

Wadham, NICHOLAS, ab.1536–1610. Founder of Wadham Coll., Oxford.

Wadsworth, ALEXANDER SCAMMELL, U S.N., 1790–1851. Captain 1825, Commodore 1834.—His father, PELEG, 1748–1829, was a Revolutionary officer, and M.C. from Me. 1793–1807.

Wadsworth, JAMES SAMUEL, 1807–1864. Brig.-gen. U. S. Vols. 1861; Republican candidate for Gov. of N. Y. 1864; distinguished at Fredericksburg and Gettysburg; killed in the Wilderness, Va.

Wadsworth, MARSHMAN EDWARD, b.1847. Teacher of Mineralogy at Harvard 1874–85; Director Mich. Mining School 1887; State Geologist of Mich. 1888; writer on Western geology.

Wafer, LIONEL, ab.1640–ab.1705. English surgeon, and traveler; on the Isthmus of Darien 1680–84. *New Voyage*, 1699.

Wafers. Thin disks of bread, used in R. C. and Anglican churches for Holy Communion.

Wage-fund Theory. Doctrine, now generally discredited, that there is in any country, at any time, an amount of wealth set apart by economic forces for the payment of wages, and that this sum is divided among all the laborers at work in that country, making the average rate of wages equal to the result of this division, unaffected by the action of government, employers, or workmen themselves.

Wager. Agreement that property shall belong to one or other of different parties on the occurrence of an uncertain event; valid in common law, but generally declared illegal by modern decisions or statutes.

Wager Policy. One in which the party assured has no

interest in the thing assured, and could not sustain any loss by the event insured against if he had not made such wager.

Wages. That share of the general product of industry which goes to laborers as remuneration for their services.

Wages, LAW OF. Statement of the economic reason for the prevailing rate of wages. None is generally accepted now, but numerous such generalizations have been proposed and received with favor; as the wage-fund theory, the "iron law" of wages of Ricardo, and the residual theory.

Wagner, ADOLF, b.1835. Political economist, prof. Dorpat 1864, Freiburg 1868, and Berlin 1870; at first a free-trader, later a leading State socialist. *Die Geld und Kredit Theorie der Peelschen Bankakte*, 1862; *System der deutschen Zettelbankgesetzgebung*, 1870; *Lehrbuch der Politischen Oekonomie*, 1871.

Wagner, JOHN, M.D., 1791–1841. Surgeon of Charleston. Eminent as an operator; prof. S. C. Medical Coll. from 1829.

Wagner, MORITZ FRIEDRICH, 1813–1887. Bavarian traveler and author, prof. Munich 1860. *Persia*, tr. 1854.—His brother,

RUDOLF, 1805–1864, prof. Erlangen 1833, and Göttingen 1840. *Anatomie*, 1834, tr. 1845; *Physiologie*, 4 vols., 1842–53.

Wagner, WEBSTER, 1817–1882. American inventor of sleeping cars 1857–58, and drawing-room or palace cars 1867.

Wagner, WILHELM RICHARD, 1813–1883. German dramatist, philosopher and musician, reformer of the opera, or regenerator of the lyric drama; one of the most striking figures in modern artistic history. He had no thorough academic training. He began his career 1832 with an incomplete opera, *Die Hochzeit*. While chorus-master at Würzburg, 1833, he wrote *Die Feen*, which was revived at Munich 1888. In Magdeburg he composed and brought forward *Das Liebesverbot* 1834, an opera based on Shakespeare's *Measure for Measure*.

Wilhelm Richard Wagner.

He now married, went to Königsberg as conductor, and to Riga 1837. In Paris, where he lived 1839–42, he finished *Rienzi* and *The Flying Dutchman*, the production of which in Dresden 1842–43 established his fame and won the conductorship of the opera. This he retained until forced to become a political refugee by his participation in the uprising of May 1849. He lived in Paris and Zurich till 1864, when Ludwig II. of Bavaria secured his amnesty and provided the means to carry out his stupendous plans, which culminated in the erection of a theater for the production of his *Ring of the Nibelung* at Bayreuth 1876, the Bayreuth festivals. Besides the operas mentioned and the tetralogy composing *The Ring of the Nibelung* (*Das Rheingold*, *Die Walküre*, *Siegfried*, and *Die Götterdämmerung*), W. wrote words and music of *Tannhäuser*, *Lohengrin*, *Tristan und Isolde*, *Die Meistersinger*, and *Parsifal*. His principal literary works, written to make propaganda for his artistic system, were gathered in 9 vols. 1871–83, again, 10 vols., 1888, and partly tr. by W. A. Ellis 1892–96.

Wagner, WILLIAM, 1796–1885. Founder and pres. W. Free Institute of Science in Phila. 1855.

Wagner, FORT. In Charleston Harbor, S. C.; assaulted unsuccessfully by the Union troops July 17–18, 1863.

Wagon Boiler. Generator of steam, introduced by Boulton and Watt, but now no longer made; named from the shape, which, from the end, resembled a canvas-topped wagon of Conestoga type. It had a flat or concave bottom, straight or inclined sides, and cylindrical top. Gases passed back under the bottom, and forward on one side to the front, and backward on the other side to the chimney. This was the wheel-draft. These boilers had automatic damper regulator and automatic feed devices, but were for low pressures only.

Wagon Vault. See VAULT.

Wagram. Village 12 m. n.e. of Vienna; site of Napoleon's victory over Archduke Charles July 5–6, 1809. The French took 20,000 Austrians prisoners: each side lost ab. 25,000 men. The battle resulted in the treaty of Schönbrunn Oct. 14.

Wagtail. See DENTIROSTRES.

Wah. See PANDA.

Wahabees. Austere sect of Mohammedan Puritans, founded in Arabia ab.1760. They made conquests, were overthrown 1812–18, but are still powerful in Nejd, and have offshoots in India.

Wahlenberg, GÖRAN GEORGE, 1780–1851. Prof. Upsala. *Flora Lapponica*, 1812; *De vegetatione et climate in Helvetia*, 1813; *Flora Carpatorum principalium*, 1814; *Flora suecica*, 1824–26.

Wahsatch Mts. See WASATCH MTS.

Waihu Island. See EASTER ISLAND.

Wainwright, JONATHAN MAYHEW, D.D., D.C.L., 1792–1854. P.E. Bp. of N. Y. 1852; musical and liturgical compiler. *Land of Bondage*, 1852.

Wait, WILLIAM, 1821–1880. Lawyer of Fulton co., N. Y. *Law and Practice in Justices' Courts*, 1865; *Actions at Law and in Equity*, 7 vols., 1877–79.

Waite, MORRISON REMICK, LL.D., 1816–1888. Ohio lawyer; counsel in Geneva Arbitration 1871–72; Chief-justice U. S. Supreme Court from 1874.—His father, HENRY MATSON, LL.D., 1787–1869, was long Judge of Conn. courts, and Chief-justice 1854.

Waits. English singers of carols at Christmas; originally watchmen with horns to mark the hours of night.

Waitz, GEORG, 1813–1886. Prof. Kiel 1842, and Göttingen 1849–75; ed. *Monumenta Germaniæ Historica*, 1875. *Deutsche Verfassungsgeschichte*, 8 vols., 1843–78; *Grundzüge dei Politik*, 1862.

Waitz, THEODOR, 1821–1864. Prof. Marburg 1848. *Psychologie*, 1846–49; *Anthropologie der Naturvölker*, 6 vols., 1859–71.

Waiver. Voluntary giving up of a legal right. In certain cases one may waive his right to sue another for a tort, and proceed as though the defendant's obligation were imposed by contract. See QUASI CONTRACT.

Wake. Watch over a corpse till burial; once practiced in Scotland, and still common among the Irish; not seldom attended with drunkenness and disorder. Candles were usually placed at the head and foot of the coffin, and spirits and food provided for the watchers. It is probably a survival from heathen times, and in its original sense a vigil. In early days in England a vigil used to be observed on the eve of the anniversary of the consecration of a church, or of the birthday of the saint to whom it was dedicated, the morrow being a holiday. These holidays came at last to be fairs and scenes of merry-making; so wake came to signify any festive gathering.

Wake, WILLIAM, D.D., 1657–1737. Bp. of Lincoln 1705, Abp. of Canterbury 1716. His tr. *Epistles of Apostolic Fathers*, 1693, is still valued.

Wakefield. Town of Yorkshire, on the Calder, 9 m. s.s.e. of Leeds. Here the Duke of York was defeated and slain with 3,000 men by Queen Margaret's army, Dec. 31, 1640. Manufactures still important, although the cloth trade has declined. Pop., 1891, 37,269.

Wakefield, EDWARD GIBBON, 1796–1862. English student of colonial questions, prominent in the organization of New Zealand.

Wakefield, GILBERT, 1756–1801. English controversialist, attacking with equal zeal Bp. Horsley, Paine, and Wilberforce; ed. Horace, Virgil, and Lucretius; imprisoned 1798–1801. *Tr. N. T.*, 1791; *Silva Critica*, 1789–95; *Memoirs*, 1792.

Wake-Robin. Several showy-flowered herbs of the genus *Trillium*, natural family *Liliaceæ*, natives of N. America.

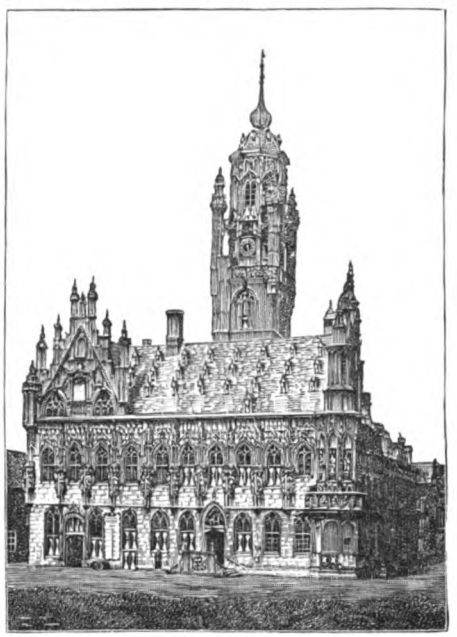
Wakley, THOMAS, 1795–1862. English medical reformer;

M.P. 1835–52; coroner of Middlesex from 1839; founder (1823) and editor of *The Lancet*, which was continued by his son, JAMES GOODCHILD, 1821–1886.

Walafridus Strabus. See STRABO, WALAHFRID.

Walch, JOHANN GEORG, 1693–1775. Prof. Jena 1724; historian of Lutheran and other controversies, in 10 vols., 1730–39.—His son, CHRISTIAN WILHELM FRANZ, 1726–1784, became prof. at Jena 1750, and at Göttingen 1753. *Hist. der Kétzereien*, 11 vols., 1762–85; *Neueste Religionsgeschichte*, 9 vols., 1771–83.

Walcheren. Dutch island, at the Scheldt's mouth; part of Zeeland; occupied by a British force 1809, in a vain expedition against Antwerp. This expedition was planned in 1807



The Stadhuis, Middleburg.

and was one of the most disastrous failures in the history of modern warfare. The people are mostly employed in agriculture. Area 81 sq. m., pop. ab. 45,000.

Walckenaer, CHARLES ATHENASE, BARON, 1771–1852. French naturalist and historical writer.

Walcot, CHARLES MELTON, 1815–1868. Anglo-American comedian and playwright.

Walcott, CHARLES DOOLITTLE, b.1850. Assistant on the U. S. Geological Survey 1879, chiefly in Utah and Nevada; paleontologist 1883, and director 1894; investigator of the Cambrian rocks and their fossils.

Waldeck, JEAN FRÉDÉRIC DE, 1766–1875. French explorer in Central America. *Yucatan*, 1837. When nearly a centenarian, he engraved the plates of *Monuments anciens de Mexique*, 1866.

Waldeck-Pyrmont. Province in n.w. Germany; formerly a constitutional hereditary monarchy; since 1868 administered by Prussia. Chief products are grain, beet-root for sugar and forage crops. Cattle-raising is of some importance. Area 438 sq. m.; pop., 1890, 57,283.

Walden (NETTER), THOMAS, ab.1374–1430. English Carmelite, active in persecuting the Lollards; prior 1414; propagandist in Lithuania 1419; founder of Carmelite nuns; writer against Wiclif's tenets; confessor to Henry V. and VI.

Waldenses. Followers of Peter Waldo (d.1197), merchant of Lyons, who gave his goods to the poor, adopted the mendicant life, and became an itinerant preacher: hence called Poor Men of Lyons. They opposed the corruptions of the Ch., basing their doctrines immediately upon Scripture; were forbidden to preach 1179, and excommunicated for disobedience 1184. Many perished in the Albigensian crusade; others were driven into the valleys of the Alps. Their bitter persecutions from 1655 called forth Cromwell's protest and Milton's famous sonnet. Many emigrated; their troubles lasted till 1848. They now number ab. 25,000 in Piedmont, and have churches and schools in various parts of Italy, Sicily, and Sardinia, and colonies in America.

Waldersee, ALFRED, GRAF VON, b.1832. Prussian general; Chief of Staff 1888, succeeding Von Moltke.—His wife, MARY (LEE), b.1837 in New York, m.1874, had in 1864 married Prince Frederick of Schleswig-Holstein, who d. 1865.

Waldeyer, HEINRICH WILHELM GOTTFRIED, b.1836. Prof. Breslau 1867, Strasburg 1872, and Berlin 1883; writer on anatomy.

Waldo, PETER. See WALDENSES.

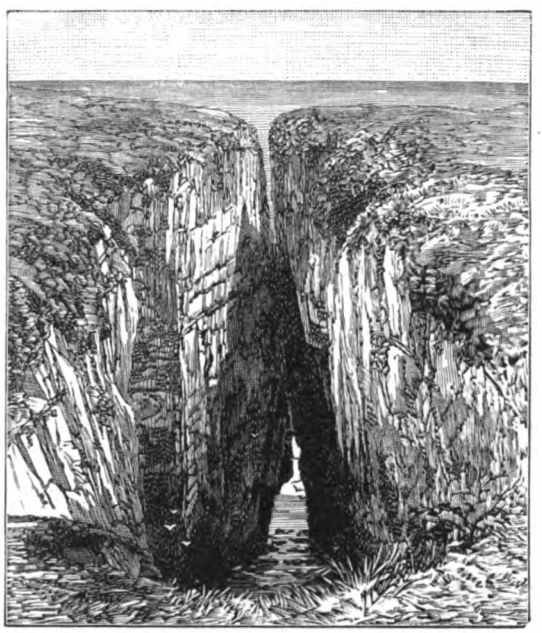
Waldseemüller, MARTIN, ab.1470–ab.1525. German geographer. His *Cosmographiæ Introductio*, 1507, first proposed to call the New World America.

Waldstein. See WALLENSTEIN.

Waldstein, CHARLES, L.H.D., b.1856 in New York. Director American School at Athens 1888; writer on archæology.

Wales. Timbers around a ship a little above the water line.

Wales. W. central portion of the island of Great Britain. Area 7,467 sq. m. Its surface is very broken and mountainous. It has great mineral wealth; iron, copper, coal, lead, and silver are mined. Anciently Cambria, the land of the Cymry, a Celtic race; it was invaded repeatedly by the Romans, but never really conquered. Many Britons retired ab. 450 from before the Saxons to the mountains of W., where



Huntsman's Leap—Effects of Erosion on South Coast.

they maintained their independence, though paying tribute to the English king. This they refused to William the Norman, who invaded and conquered them, but allowed them to retain their own princes. Rebellions followed: Henry II. subdued S. W. 1157; Edward I. finished the work 1282, and bestowed the title of Prince of W. on the heir of the English throne 1284. Complete incorporation into the kingdom was deferred until 1536.

Wales, JAMES ALBERT, 1852–1886. Cartoonist of New York *Puck* and *Judge*.

Wales, PHILIP SKINNER, M.D., b.1837. Surgeon-gen. U. S. Navy 1880–84; medical writer.

Wales, PRINCE OF. See ALBERT EDWARD.

Wales, PRINCESS OF. See ALEXANDRA, CAROLINE.

Walewski, ALEXANDER FLORIAN JOSEPH COLONNA, COUNT, 1810–1868. Polish patriot, in France from 1832; envoy to Naples and England; Foreign Minister 1855–60; Duke 1866.

Walhalla. Imitation of the Parthenon, erected 1830–41 near Ratisbon, Bavaria. It contains many statues, busts, and tablets, illustrative of German history. See VALHALLA.

Walk. See GAITS and WALKING.

Walke, HENRY, U.S.N., 1808–1896. Commander 1855, Captain 1862; distinguished on the Mississippi; Commodore 1866, Rear-admiral 1870. *Naval Scenes*, 1877.

Walker, ABRAHAM JOSEPH, 1818–1872. Chief-justice of Ala. 1859–68.

Walker, ALEXANDER, b.1819. Journalist of New Orleans; biographical and historical writer.

Walker, AMASA, LL.D., 1799–1875. Lecturer on Political Economy at Oberlin 1842–48, and Amherst 1859–69; M.C. from Mass. 1862–63. *Money*, 1857; *Science of Wealth*, 1866.—His son, FRANCIS AMASA, LL.D., 1840–1897, was Adjutant-gen. in Va. 1862–65, Supt. of U. S. Census 1870 and 1880, prof. Yale 1873–81, chief of Bureau of Awards at U. S. Centennial Exhibition 1876, and pres. Mass. Institute of Technology from 1881. *Wages*, 1876; *Money*, 1878–79; *Land and its Rent*, 1883; *Political Economy*, 1883; *Hist. 2d Army Corps*, 1886; *Life of Gen. Hancock*, 1894; *Making of the Nation*, 1895; *Double Taxation in U. S.*, 1896.

Walker, CLEMENT, d.1651. M.P. 1640; imprisoned from 1649. *Hist. Independency*, 1646–60.

Walker, FREDERICK, A.R.A., 1840–1875. English painter.

Walker, GEORGE, D.D., d.1690. Defender of Londonderry 1689; made its bishop; killed at the Boyne.

Walker, GILBERT CARLTON, 1832–1885. Gov. of Va. 1870–74; M.C. 1875–79.

Walker, SIR HOVENDEN, R.N., ab.1660–1726. Rear-admiral 1709; knighted 1711. He failed in an attack on Canada 1711, lost his ship by explosion 1715, and was dismissed.

Walker, JAMES, D.D., LL.D., 1794–1874. Ed. *Christian Examiner* 1831–39; prof. Harvard 1839–53, pres. 1853–60; ed. Reid and Dugald Stewart. *Memoir of Josiah Quincy*, 1867.

Walker, JAMES BARR, D.D., 1805–1887. American journalist and lecturer, whose *Philosophy of the Plan of Salvation*, 1855, was widely read and translated. *Doctrine of the Spirit*, 1870.

Walker, JOHN, d. ab.1730. Rector at Exeter, Eng. His noted book, *Sufferings of the Clergy sequestered in the Rebellion*, 1714, called forth answers from Calamy and others.

Walker, JOHN, 1732–1807. English elocutionist and lexicographer. His *Rhyming Dictionary*, 1775, is still printed; his *Pronouncing Dictionary*, 1791, was in use 1850 or later.

Walker, JOHN, 1770–1831. English antiquarian and compiler. *Oxoniana*, 4 vols.

Walker, JOHN GRIMES, U.S.N., b.1835. Lieutenant 1858; active on the Mississippi 1862–63, and on the Atlantic coast 1864–65; Commander 1866, Captain 1877, Commodore 1889, Rear-admiral 1895.

Walker, JOSEPH REDDEFORD, 1798–1876. Frontiersman; guide of several parties to Cal. from 1833; discoverer of the Yosemite.

Walker, LEROY POPE, 1817–1884. Judge in Ala. 1850–53; Sec. of War, C.S.A., 1861–62.—His father, JOHN WILLIAMS, 1789–1823, was U. S. Senator from Ala. 1819–20.

Walker, ROBERT JAMES, 1801–1869, b. in Pa. U. S. Senator from Miss. 1836–45; Sec. Treasury 1845–49; author of the tariff of 1846; Gov. of Kan. 1857–58; Unionist; U. S. financial agent in Europe 1863–64.

Walker, SEARS COOK, 1805–1853. Builder of the Observatory at Phila. High School 1837; prof. Washington Observatory 1845–47; connected with the U. S. Coast Survey from 1847. *Neptune*, 1850–52.—His brother, TIMOTHY, LL.D., 1806–1856, was prof. Cincinnati Law School 1833–44, and founder *Western Law Journal*, 1843. *Introduction to American Law*, 1837.

Walker, THOMAS, 1784–1835. English lawyer. *Pauperism*, 1826; *The Original*, 1835.

Walker, WILLIAM, 1824–1860. American filibuster. He attacked Sonora, n.w. Mexico, 1854; descended on Nicaragua 1855, assumed the presidency, and was expelled 1857; was frustrated in two more attempts 1857–58; landed in Honduras June 1860, and was arrested and executed. *War in Nicaragua*, 1860.

Walker, WILLIAM H. T., 1816–1864. Officer U.S.A. 1840–60; distinguished in Mexico; Major-gen. C.S.A. 1862; killed at Decatur, Ga.

Walker, WILLIAM MCCREARY, U.S.N., 1813–1866. Captain 1862; active in blockading. *Screw Propulsion*, 1861.

Walker, WILLIAM SIDNEY, 1795–1846. English poet and Shakespearian critic.

Walker, LAKE. In w. Nevada; sink of W. River; dscovered 1833 by Joseph R. Walker. Area 110 sq. m.

Walker-Martinez, CARLOS, b.1842. Chilian poet.

Walking. Means of locomotion in which the knees are alternately straightened and the heel of one foot is on the ground before the toe of the other leaves it; sometimes called "fair heel and toe." Track contests are usually under this rule, but long-distance and six-day walking are more generally "go-as-you-please" matches, wherein the contestants may walk, run, hop, or make their progress in any way they desire, but without any adventitious aids. See RUNNING.

The records are as follows: Greatest distance walked in one hour, by an amateur 8 m. 1,487⅜ yd., by a professional 8 m. 302 yd.; 2 h., A., 13 m. 900 yd, P., 15 m. 824 yd.; 3 h., A.,19 m. 1,685 yd., P., 22 m. 456½ yd.; 4 h., A., 25 m. 1,070 yds., P., 27 m. 440 yd.; 24 h., A., 120 m., P., 127 m. 1,201 yd. Distance walking: ⅛ m., A., 3 min. 2⅗ sec.; 1 m., P., 6 min. 23 sec., A., 6 min. 29⅗ sec.; 2 m., P., 13 min. 14 sec., A., 13 min. 33 sec.; 3 m., P., 20 min. 21½ sec., A., 21 min. 9⅕ sec.; 10 m., P., 1 h. 14 min. 45 sec., A., 1 h. 17 min. 40¾ sec.; 20 m., P., 2 h. 29 min. 57 sec., A., 2 h. 47 min. 52 sec.; 50 m., P., 7 h. 54 min. 16 sec., A., 8 h. 25 min. ½ sec.; 100 m., P., 18 h. 8 min. 15 sec., A., 19 h. 41 min. 50 sec. The following by professionals: 200 m., 40 h. 46 min. 30 sec.; 300 m., 66 h. 30 min.; 400 m., 96 h. 51 min. 3 sec.; 500 m., 130 h. 34 min.; 531 m., 138 h. 49 min. 8 sec.

Walking-Beam. See BEAM, WALKING, and BEAM ENGINE.

Walking-Leaf. *Camptosorus rhizophyllus.* Fern which has the habit of rooting at the tips of its leaves, thus producing new plants; native of e. N. America.

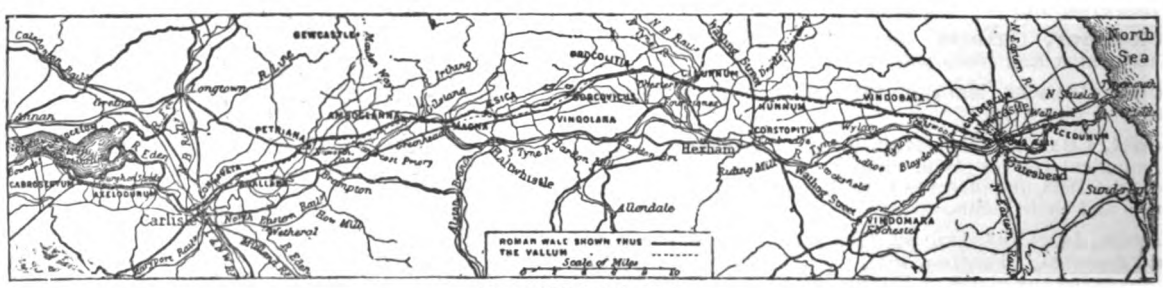
Walking-Leaf. Orthopterous insect of the e. Indian region, having its wings and the expanded joints of its legs developed to imitate leaves in appearance.

Walking-Stick (STICK INSECT). Orthopterous insect with elongated slender body and rudimentary wings. It resembles a leafless twig. *Diapheromera* is the common American genus, of family *Phasmidæ*.

Walkyries. See VALKYRIES.

Wall. See ANTONINE, WALL OF, BUTTRESS, FORTIFICATION, OFFA, and WALL, HADRIAN'S.

Wall, HADRIAN'S, or ROMAN WALL. Stone wall and other works erected in 1st century in the n. of England by the Romans, between the Solway and the Tyne. On the English side of the border we find a stone wall with a ditch on its n. side. Attached to it are stationary camps, mile-castles, and turrets for the accommodation of the soldiery who manned it. To the s. of the stone wall are a series of ramparts. Considerable traces of the wall yet remain in Northumberland.



Plan of Hadrian's Wall.

Wall, WILLIAM, D.D., 1646–1728. Vicar of Shoreham, Kent, from 1676. His large *History of Infant Baptism*, 1705, was tr. into Latin, and reprinted 1862.

Wallace, ALFRED RUSSEL, LL.D., b.1822. English naturalist, pensioned 1881. *The Amazon*, 1853; *Malay Archipelago*, 1869; *Natural Selection*, 1870; *Miracles and Modern Spiritualism*, 1875; *Distribution of Animals*, 1876; *Island Life*, 1880; *Land Naturalization*, 1882; *Bad Times*, 1885; *Darwinism*, 1889; *Australia*, 1893.

Wallace, SIR JAMES, R.N., ab.1730–1803. Post-captain 1771; in America 1774–83; Rear-admiral 1794. He burned Kingston, N. Y., and did much damage on the Hudson Oct. 1777.

Wallace, JOHN WILLIAM, 1815–1884. Reporter of U. S. Supreme Court 1863–76. *Cases*, 23 vols., 1864–76.—His brother, HORACE BINNEY, 1817–1852, pub. *Stanley*, 1838, and, with J. I. C. Hare, edited *American Leading Cases*, 1847. *Papers*, 1855–56.

Wallace, LEWIS, b. 1827. Brig.-gen. U. S. Vols. 1861; Major-gen. 1862–65; prominent at Fort Donelson, Shiloh, and the Monocacy; Gov. Utah 1878–81; U. S. Minister to Turkey

1881–85. His novel, *Ben Hur*, 1880, was immensely popular. *The Fair God*, 1873; *Prince of India*, 1893.—His wife, SUSAN ARNOLD (ELSTON), b.1830, m.1852, has written much in prose and verse.—His father, DAVID, 1799–1859, was Gov. of Ind. 1837–40, and M.C. 1841–43.

Wallace, WILLIAM, 1270–1305. Scottish insurgent. After the repulse near Lochnaber he retired to the Highlands; defeated Earl Surrey at Cambuskenneth, Sept. 10, 1297, and ravaged n. England; was elected guardian of the realm; was defeated at Falkirk, July 22, 1298, but maintained a guerrilla warfare; was declared an outlaw 1304, betrayed to the English 1305; tried for treason, and executed Aug. 24.

Wallace, WILLIAM, 1768–1843. Prof. of Mathematics at Edinburgh 1819–38. *Conic Sections*, 1808; *Geometrical Theorems*, 1838.

Wallace, WILLIAM A., 1827–1896. U. S. Senator from Pa. 1875–81; State Senator 1862–75.

Wallace, WILLIAM HARVEY LAMB, 1821–1862. Brig.-gen. U. S. Vols. 1862; mortally wounded at Shiloh.

Wallace, WILLIAM ROSS, 1819–1881. American poet.

Wallace, WILLIAM VINCENT, 1814–1865. Irish opera-composer and traveler; one of the founders of the New York Philharmonic Society; long in Germany. *Maritana*, 1845; *Matilda of Hungary*, 1847; *Lurline*, 1860; *Amber Witch*, 1861; *Love's Triumph*, 1862; *Desert Flower*, 1863.

Wallachian. See ROUMANIAN.

Wallack, JAMES WILLIAM, 1794–1864. Anglo-American actor and manager, long popular in comedy and melodrama.—His son, JOHN LESTER, 1820–1888, succeeded him at Wallack's Theater, wrote two comedies, and was highly successful in young men's parts. *Memoirs*, 1889.

Walla-Walla. Capital of county of same name, Wash. It has water-power, flour-mills and machine-shops. Pop., 1895, 7,770.

Walla-Walla. Idaho Indians of the Nez Percés group; now ab. 200 on a reservation near Ft. Simcoe.

Wallenstein, or **Waldstein,** ALBRECHT WENZEL EUSEBIUS VON, 1583–1634. Bohemian officer, famous in the Thirty Years' War; of brilliant ability, vast wealth, and boundless ambition; celebrated in Schiller's trilogy; made Count 1617, Duke of Friedland 1624, of Sagan 1627, and of Mecklenburg 1629. He suppressed a rising 1618, created and led an army 1625, defeated Mansfeld at Dessau April 25, 1626, and with

Wallenstein.

Tilly repressed the Protestant princes, but won enmity by his arrogance, and was dismissed by the Emperor Ferdinand 1630. In 1631 he was reinstated, given absolute authority, and took the field against Gustavus Adolphus and the Swedes, who defeated him at Lützen Nov. 16, 1632. After many intrigues with the enemy he was proclaimed a traitor Jan. 1634, and murdered by his Scotch and Irish officers Feb. 25. *Letters*, 1828–29.

Waller, EDMUND, 1606–1687. English poet, highly valued in his own age; imprisoned 1643 for a royalist plot; in exile 1644–53; reviver of the heroic couplet. His verse is graceful but slight.

Waller, THOMAS MCDONALD, b. ab.1840. Gov. of Conn. 1883–85; Consul-gen. in London 1885–89.

Waller, SIR WILLIAM, 1597–1668. General of Parliamentary troops 1642–45; thrice defeated and once victorious; twice expelled from Parliament and imprisoned. *Vindication*, pub. 1793.

Wallerton, CHARLES LOUIS AUGUSTE, 1721–1788. French botanist, in Mexico and W. Indies 1760–65. *Plantes médicinales*, 1767–70; *Flore de Mechoacan*, 1775–79.

Wall Flower. *Cheiranthus cheiri*. Perennial herb of the natural family *Cruciferæ*, native of s. Europe, much planted for ornament.

Wallich, NATHANIEL, 1786–1854. Danish-English botanist, long in India. *Plantæ Asiaticæ rariores*, 1830–32.

Wallin, JOHAN OLOF, 1779–1839. Swedish poet and hymnist; Abp. of Upsala 1837.

Walling, GEORGE WASHINGTON, 1823–1891. Supt. of New York Police 1874–85.

Walling, HENRY FRANCIS, 1825–1888. Assistant U. S. Coast Survey and Geological Survey; cartographer.

Wallis. See VALAIS.

Wallis, JOHN, D.D., F.R.S., 1616–1703. Prof. Oxford 1648; writer on mathematics, grammar, logic, and theology; ed. Ptolemy. *Arithmatica Infinitorum*, 1655; *Opera*, 1695–99, repub. 1791.

Wallis, SEVERN TEACKLE, 1816–1894. Lawyer and reformer of Baltimore. *Spain*, 1853.

Wallon, HENRI ALEXANDRE, b.1812. Prof. Paris 1840; Deputy 1849 and 1871; Minister of Instruction 1875, Senator 1876; writer on French history. *De l'Esclavage*, 1847–48.

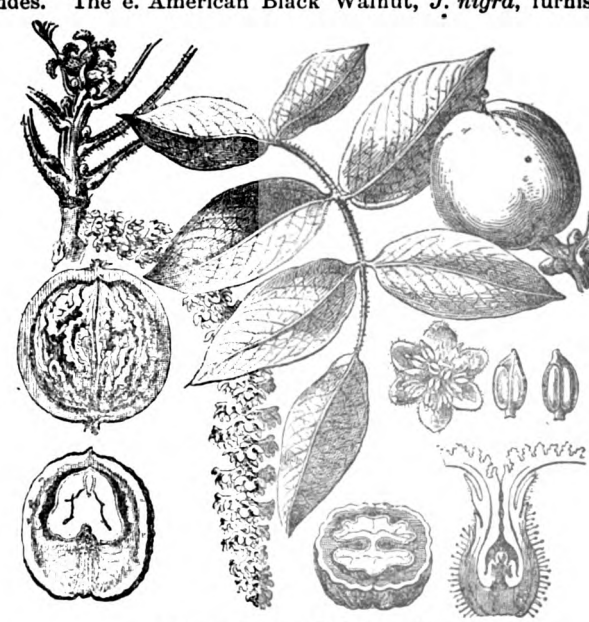
Walloons. Inhabitants of s. Belgium; of mixed Gallic and Teutonic descent; distinguished from the Flemings. Under Charles V. and Philip II. many emigrated to England; later, some came to America.

Wall Paper. Paper prepared for hanging upon walls to render them more sightly; or for the purpose of coloring them, as in photographic studios. Paper hangings were first attached instead of tapestry ab.1555. The Japanese used powdered mica to give it a shiny appearance. Before the paper-making machine was invented it was obtained in limited sizes. See PAPER HANGINGS.

Wall Plate. Plate of iron or timber, placed under the supports of a bridge, usually extending across the space between the two trusses.

Wallroth, KARL FRIEDRICH WILHELM, 1792–1857. Physician and botanist in Nordhausen. *Naturgeschichte der Flechten*, 1825–27; *Flora cryptogamica Germanica*, 1833; *Beiträge zur Botanik*, 1842–44.

Walnut. Large trees of the genus *Juglans*, natural family *Juglandaceæ*, natives of the n. temperate zone and of the Andes. The e. American Black Walnut, *J. nigra*, furnishes



English Walnut (*Juglans regia*).

valuable timber, used for joinery, furniture and gun-stocks. The English Walnut, *J. regia*, yields a fixed drying oil, used by artists and varnish makers. The Butternut, *J. cinerea*, produces a valuable timber, and a decoction of the bark of the

root is a useful cathartic. The Japanese Walnut, *J. sieboldiana*, bears fruit in long clusters. All are esteemed for their nuts.

Walpers, WILHELM GERHARD, 1816–1853. German botanist. *Repertorium botanices systematicæ*, 1842–48; *Annales botanices systematicæ*, 1848–68.

Walpole, HORACE, 1717–1797. M.P. 1741–68; 4th Earl of Oxford 1791. His house, Strawberry Hill, near Twickenham, contained notable collections and a private press. *Castle of Otranto*, 1764; *Letters*, 9 vols., 1857–59.—His father, SIR ROBERT, 1676–1745, M.P. from 1701, Whig leader, was expelled and imprisoned 1712, made Privy Councilor 1714, Premier 1715–17 and 1721–42; Lord Oxford 1742. Ruling by bribes, he was long the most powerful man in England.

Walpole, SPENCER, LL.D., b.1839. Biographer of Lord John Russell, 1889. *Hist. of England from 1815*, 5 vols., 1878–86.

Walpurga, ST., d.779. English abbess of Heidenheim, Wurtemberg; sister of St. Willibald. Her day, May 1, follows Walpurgis Night, when witches were supposed to hold high revel.

Walpurgis Night. Eve of May-day. A special time of revelry for witches at certain places; the Brocken in Germany is the favorite.

Walrus (TRICHECHUS or ROSMARUS). Marine seal-like carnivore of Arctic regions, formerly more widely distributed. *T. rosmarus*, the Atlantic Walrus, is found about Davis Straits and northward, and about Spitzbergen. *T. obesa*, of the Pacific, is restricted to the coasts of Kamchatka, Alaska, and Walrus Island, among the Pribylof Isles. Walruses have a rudimentary tail: the hind feet turn forward. Their adult dentition is $I\frac{1}{0}$ $C\frac{1}{1}$ $M\frac{3}{3}$, but the other teeth have been lost during growth. The upper canines are developed as long tusks,

Atlantic Walrus (*Trichechus rosmarus*).

projecting downward, and used for digging up clams, which form their chief food. They live in herds, are timid, and keep a sentinel on watch. Their chief enemy, besides Man, is the Polar Bear. They courageously unite to defend a wounded comrade. The female bears one or two young in May, covered with short brownish-yellow hair, which nearly all disappears with age. The males, larger than the females, may attain a length of 12 ft., and weight of more than 2,000 lbs. They are valued for their oil, hides, flesh, and ivory, and are in danger of extinction.

Walsall. Borough of Staffordshire, 8 m. n.n.w. of Birmingham. It has extensive iron works. Pop., 1891, 71,791.

Walsh, BENJAMIN DANN, 1808–1869. Entomologist of Ill.

Walsh, ROBERT, 1784–1859. Founder and editor *American Review*, 1811–13 and 1827–37, and Phila. *Gazette*, 1819–36; in Paris from 1837. *French Government*, 1810; *Russia*, 1813; *Didactics*, 1836.—His grandson, WILLIAM SHEPARD, b.1854, edited *Lippincott's Mag.* 1886–90. *Faust*, 1887; *Paradoxes*, 1888.

Walsh, WILLIAM, 1663–1707. English poet, once called "the Propertius of the Restoration."

Walsh, WILLIAM PAKENHAM, D.D., b.1820. Dean of Cashel 1873; Bp. of Ossory 1878; writer on missions.

Walsingham, SIR FRANCIS, ab.1536–1590. English envoy to France 1570–73 and 1581; knight and Sec. of State 1573; introducer of an elaborate system of espionage; enemy and judge of Mary Stuart.

Walsingham, THOMAS, ab.1400. Monk of St. Albans; chronicler.

Walter, JOHN, 1739–1812. Founder of the London *Times*, 1788, and its owner, as were his son and grandson till 1894.

Walter, THOMAS, ab.1745–ab.1800. Anglo-American botanist. *Flora Caroliniana*, 1788.

Walter, THOMAS USTICK, LL.D., 1804–1887. Architect of Girard Coll., Phila., finished 1847, of the enlarged U. S. Capitol 1851–65, and other buildings at Washington.

Walters, LUCY, 1630–1683. Mistress of Charles II. and mother of James, Duke of Monmouth.

Walthall, EDWARD CARY, b.1831. Brig.-gen. C.S.A. 1862, Major-gen. 1864, serving in the West; U. S. Senator from Miss. 1885–95.

Waltham. City of Middlesex co., Mass., on the Charles, 10 m. w. of Boston; chartered 1737 and 1884; noted for its machine-made watches. It has also extensive cotton manufactories. Pop., 1890, 18,707.

Waltham. Town of Essex, Eng., 13 m. n.e. of London; called also W. Abbey and W. Holy Cross. Here the Lee is diverted into several channels forming a network of islands, on which are four gunpowder mills belonging to the govern-

Waltham Abbey Church.

ment: nearby there are small-arms and cordite factories. It retains the nave and lady chapel of the famous old abbey, of which the church was founded in the time of Canute. Pop. 6,100.

Waltham Forest. See EPPING FOREST.

Walther, CARL FERDINAND WILHELM, D.D., 1811–1887. Leader of Saxon immigrants to Mo. 1839; founder of Lutheran Synod of Mo. 1846, and of its publications; pres. of its theol. sem. from 1849. *Pastoral Theologie*, 1872.

Walther, VON DER VOGELWEIDE, ab.1165–ab.1230. German poet, the greatest of his time. His works are amatory, satiric, political, religious, and didactic, and have repeatedly been collected.

Waltner, CLAUDE ALBERS, b.1846 in Paris. Etcher, especially fine in nude figures. No other is so successful in handling flesh, the most difficult thing to represent adequately with the needle on copper: his touch gives the feeling of color in his modeling. His *Angelus*, after Millet, and *Dans la Rosée*, after Duran, are highly prized.

Walton, BRIAN, D.D., 1600–1661. Prebendary of St. Paul's 1639; deprived of his living 1642; Bp. of Chester 1660; editor of an important polyglot Bible in 6 vols. folio, 1654–57.

Walton, GEORGE, 1740–1804. Delegate to Congress 1776–81; signer Declaration of Independence; Gov. of Ga. 1779 and 1789; Chief-justice 1783; U. S. Senator 1795–96.

Walton, ISAAK, 1593–1683. English biographer of Herbert, Hooker, Donne, and others, frequently reprinted. Still more famous is his *Compleat Angler*, 1653.

Waltz. Round dance in $\frac{3}{4}$ time, the most popular of the century. Its unquestioned history does not extend back of 1775, and it did not become fashionable until after 1800. When introduced in England it was called the German Waltz, and was probably developed out of a popular dance in Bohemia, Bavaria, or Austria. Originally its music consisted of two sections of eight measures each in triple time; but it has

been extensively and freely developed, and even given a place in the highest form of artistic music, the symphony. The most successful composers of waltzes as dances have been the STRAUSSES (q.v.).

Waltzeemuller. See WALDSEEMULLER.

Waltzing Giants. 1. Funnel-shaped cloud of smoke attending forest and prairie fires. 2. Dust-whirls as seen from a distance careering along dry plains and valleys. See WHIRLWINDS.

Walworth, JEANNETTE RITCHIE (HADERMANN), b. 1837. American novelist. *Southern Silhouettes*, 1887.

Walworth, REUBEN HYDE, LL.D., 1788–1867. M.C. 1821–23; Chancellor of N. Y. 1828–48. *Rules of Chancery*, 1829; *Hyde Genealogy*, 1864.—His son, CLARENCE ALPHONSUS, b.1820, R. C. priest, has pub. *The Gentle Skeptic*, 1860, and poems.—His brother, MANSFIELD TRACY, 1830–1873, pub. *Warwick*, 1868, and other romances.

Wampum. Small shells and beads, strung together and used by N. American Indians as money and for decoration.

Strings of Wampum.

The favorite material was round clam shells, white, black, or violet-purple in color, which were drilled through lengthwise and strung upon a thread.

Wanamaker, JOHN, b.1838. Phila. merchant; founder Bethany S.-S. 1858; pres. Phila. Y.M.C.A. 1870–83; U. S. Postmaster-gen. 1889–93.

Wandering Jew. Cartaphilus, or Ahasuerus; legendary character, known as Cartaphilus from ab.1250, and Ahasuerus from ab.1500, condemned, for inhumanity to the suffering Christ, to roam till the Second Advent; celebrated by Sue and many romancers.

Wanderley, JOAO MAURICIO, 1815–1889. Brazilian Minister of State, made Baron of Cotegipe 1868; Premier 1885–88.

Wanderoo. See MACAQUES.

Wangenheim, FRIEDRICH ADAM JULIUS, FREIHERR VON, 1747–1800. German officer, in U. S. 1777–83; writer on arboriculture.

Wanklyn, JAMES ALFRED, b.1834. English chemist; writer on analysis of water, milk, bread, and air. *Tea*, 1874.

Wanton, JOSEPH, 1705–1780. Gov. of R. I. 1769–75.

Wapenshaw. Mediæval Scottish assemblage in preparation for war.

Wapiti. See ELK.

Wappæus, JOHANN EDUARD, 1812–1879. Prof. Göttingen from 1845; writer on geography.

Wappers, GUSTAVE, 1803–1874. Belgian historical painter, ennobled 1847; in Paris from 1855.

War. See the different titles pertaining to military engineering.

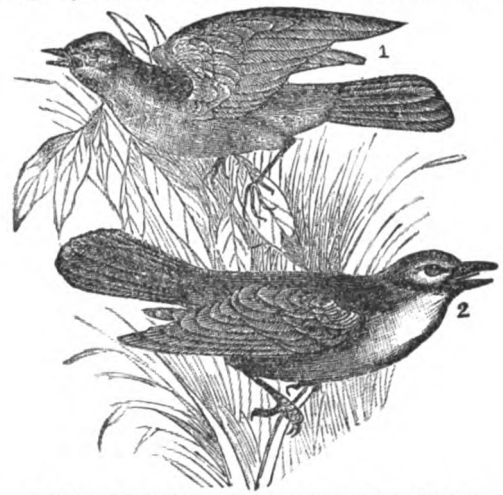
War, ARTICLES OF. See RULES AND ARTICLES OF WAR.

War, CIVIL. War between different parties of the same nation. Such as the War of the Roses in England 1455, when the crown was fought for by contending princes. The war of 1861–65 in the U. S. is called by some a civil war, but it has been officially designated by the U. S. Government as the War of the Rebellion. See VOLUNTEERS.

War, COUNCIL OF. SEE COUNCIL OF WAR.

Warbeck, PERKIN, ab.1472–1499. English pretender, who resembled Edward IV., and was acknowledged as his son in France, Burgundy, and Scotland. He invaded the kingdom from Scotland 1496–98, surrendered, escaped, was recaptured and executed.

Warblers. Many species of small, oscine birds, belonging mainly to two families. Most are insectivorous and migratory; with few exceptions they are poor singers; but the nearly related Thrush family (*Turdidæ*) makes up for this lack. The Old World Warblers form the family *Silviidæ*, characteristic of the Mediterranean region. They are dull colored, with slender bill, notched near the end; 10 primaries are present. Examples are Sedge Warblers; the Grasshopper Warbler, which dwells in thickets and imitates the chirp of a cricket; the Black-cap Warbler, noted for the range of modulation of its voice; and the Tailor-bird of India, which sews the leaves together on the end of a twig, making a pocket in which it builds its nest. American Warblers belong to the family *Mniotiltidæ*. Only 9 primaries are present: the plumage is rather brightly colored. Examples are the Golden and Wood



1, Sedge Warbler (*Salicaria phragmitis*); 2, Willow Warbler (*Sylvia trochilus*).

Warblers (*Dendroica*), Fly-catching Warblers (*Setophaga*), Creeping Warblers (*Parula*), Ground or Water Warblers (*Seiurus*), and Worm-eating Warblers (*Helminthophila*).

Warburton, ELIOT, 1810–1852. Irish author. *Crescent and Cross*, 1844; *Prince Rupert*, 1849; *Darien*, 1851.—His brother, GEORGE, 1812–1857, pub. *Hochelaga*, 1846, and *Conquest of Canada*, 1849.

Warburton, WILLIAM, D.D., 1698–1779. Dean of Bristol 1757, Bp. of Gloucester 1760. His *Divine Legation of Moses*, 1738–41, won great repute. *Works*, 7 vols., 1788; *Letters*, 1808.

Warburton River. In Australia, flowing s. to Lake Eyre.

Ward. 1. A guard or watch. 2. Municipal subdivision. 3. Minor as related to his guardian.

Ward, AARON, 1790–1867. M.C. 1825–29 and 1831–37; Major-gen. N. Y. militia 1835–53. *Around the Pyramids*, 1863.—His nephew, ELIJAH, 1816–1882, was M.C. from N. Y. 1857–59 and 1861–65. *Speeches*, 1877.

Ward, ADOLPHUS WILLIAM, LL.D., b.1837. Prof. Owens Coll., Manchester, 1866, principal 1888; biographer of Chaucer, 1880, and Dickens, 1882; tr. Curtius' *Hist. Greece*, 1868–73. *Hist. Dramatic Literature*, 1875.

Ward, ANDREW HENSHAW, 1784–1864. Mass. genealogist. *Ward Family*, 1851; *Rice Family*, 1858.

Ward, ANN. See RADCLIFFE, MRS.

Ward, ARTEMAS, 1727–1800. Brig.-gen. Mass. troops 1774; commanding nominally at Bunker Hill; first major-gen., commissioned by Congress June 1775; in command near Boston, then second to Washington till May 1776; M.C. 1791–95.

Ward, ARTEMUS. See BROWNE, CHARLES F.

Ward, EDWARD MATTHEW, 1816–1879. English historical painter, R.A. 1855.

Ward, ELIZABETH S. See under PHELPS, AUSTIN.

Ward, FREDERICK TOWNSEND, 1831–1862. American adventurer, who served with the French in the Crimea, and under Walker in Nicaragua. He entered the service of China 1860, organized "the ever-victorious army," repeatedly defeated the Taiping rebels, became a Mandarin and Admiral-gen., was killed near Ningpo, and was succeeded by Gen. C. G. Gordon.

Ward, GENEVIEVE (LUCIA LEE), b.1833. American singer and actress, well known in Europe 1873–88; in the U. S. 1881–82. She became Countess Guerbel 1851.

Ward, HENRY AUGUSTUS, b.1834. Prof. Rochester Univ. 1860–75, where he formed large cabinets of mineralogy and geology.—His uncle, FERDINAND, b.1812, was missionary at Madras 1836–47, and pub. *India*, 1850.

Ward, JAMES HARMAN, U.S.N., 1806–1861. Commander 1853; killed on the Potomac. His *Naval Ordnance*, 1851, and *Tactics*, 1859, were long used at Annapolis.

Ward, JOHN ELLIOTT, b.1814. U. S. Minister to China 1859–61.

Ward, JOHN HENRY HOBART, b.1823. Brig.-gen. U. S. Vols. 1862–65, serving in Va.

Ward, JOHN QUINCY ADAMS, b.1830. American sculptor. His *Freedman*, 1861, and *Indian Hunter*, 1864, are well known. His statues of Gen. Reynolds, Gen. Thomas, Pres. Garfield, H.

W. Beecher, and many others, are of later date.—His brother, EDGAR MELVILLE, b.1839, is a painter. N.A. 1883.

Ward, JULIUS HAMMOND, 1837–1897. Biographer of J. G. Percival, 1866, and Bp. White, 1891.

Ward, LESTER FRANK, b.1841. Assistant on U. S. Geological Survey 1881; Curator of Fossil Botany in the National Museum since 1888. His investigations have added largely to our knowledge of American fossil floras. *Dynamic Sociology*, 1883; *Psychic Factors of Civilization*, 1893.

Ward, MARCUS LAWRENCE, 1812–1884. Gov. of N. J. 1865–68; M.C. 1873–75.

Ward, MARY AUGUSTA (MRS. HUMPHRY), b.1851 in Tasmania. English novelist; granddaughter of Dr. Thomas Arnold; m.1872. Her chief works, *Robert Elsmere*, 1888, *David Grieve*, 1891, *Marcella*, 1894, and *Sir George Tressady*, 1896, are full of thought and knowledge. In genius, in earnestness, and in mental freedom, she may be called the successor of George Eliot.

Ward, MRS. HUMPHRY. See WARD, MARY A.

Ward, NATHANIEL, ab.1579–1652. Pastor at Ipswich, Mass., 1634–37; author of the first code of New England laws, 1641. *Simple Cobbler of Agawam*, 1647.

Ward, RICHARD, 1689–1763. Gov. of R. I. 1740–43.—His son, SAMUEL, 1725–1776, was Chief-justice of R. I. 1761, Gov. 1763 and 1765–66, and delegate to Congress 1774–76.—His great-grandson, SAMUEL, 1814–1884, noted for accomplishments and world-wide acquaintance, pub. *Lyrical Recreations*, 1865.—One of his sisters is Mrs. Julia Ward Howe; another became the wife of Crawford the sculptor, and mother of F. Marion Crawford, the novelist.

Ward, RICHARD HALSTED, M.D., b.1837. American inventor of improvements in microscopy.

Ward, ROBERT PLUMER, 1765–1846. English official, juristic writer and novelist; M.P. 1802–20; pensioned 1831. *Law of Nations*, 1795; *Belligerents and Neutral Powers*, 1801; *Tremaine*, 1825; *De Vere*, 1827; *Revolution of 1688*, 1838.—His son, SIR HENRY GEORGE, ab.1796–1860, was M.P. 1832–49, and Gov. of Ceylon 1856. *Mexico*, 1828–29.

Ward, WILLIAM, 1769–1823. English Baptist, missionary at Serampore, India, from 1799. *Writings, Religion, and Manners of the Hindus*, 4 vols., 1811.

Ward, WILLIAM HAYES, D.D., LL.D., b.1835. Ed. New York *Independent* since 1870; Assyriologist; explorer in Babylonia 1884.

Ward, WILLIAM THOMAS, 1808–1878. M.C. from Ky. 1851–53; Brig.-gen. U. S. Vols. 1861–65, serving chiefly in Tenn. and Ga.

Warden. Name given to various officers; as the warden of a prison, church warden, and others. A keeper; a guardian.

Warden, DAVID BAILLIE, 1778–1845. U. S. Consul in Paris from 1805. His *Account of U. S.*, 1819, was tr. into French and German. *Bibliotheca Americana*, 1820–31.

War Department of U. S. This has charge of all duties connected with the army, fortifications, the distribution and movement of troops, purchase, issue, and care of warlike stores, munitions of war, supplies, transportation, payments to troops, etc.: the head of this department is the Secretary of War, who is appointed by the President and confirmed by the Senate. He is a member of the President's Cabinet.

Wardian Cases. Nearly air-tight glass cases for growing plants, which thus live in an atmosphere saturated with moisture; invented by Nathaniel B. Ward (1791–1868).

Wardian Case.

Wardlaw, LADY ELIZABETH (HALKETT), 1677–1727; m. 1696. Scottish author of *Hardyknute*, 1719; doubtfully credited with other ballads, probably much older.

Wardlaw, RALPH, D.D., 1779–1853. Scottish Congregationalist; pastor in Glasgow from 1803, prof. from 1811; prolific theological writer.

Ware, HENRY, D.D., 1764–1845. Divinity prof. at Harvard 1805–40. *Letters to Trinitarians*, 1820.—His son, HENRY, D.D., 1794–1843, prof. Cambridge Divinity School 1830–42, wrote much in prose and verse.—His brother, WILLIAM, 1797–1852, ed. *Christian Examiner* 1839–44, pub. three brilliant classical romances, *Zenobia*, 1837, *Aurelian*, 1838, and *Julian*, 1841.

Ware, MARY GREENE (CHANDLER), b.1818. American writer. *Elements of Character*, 1818; *Thoughts in my Garden*, 1862; *Death and Life*, 1864.

Ware, WILLIAM ROBERT, b.1832. Prof. Architecture Mass. Inst. Tech. 1865, Columbia Univ. 1881.

Warehouseman. Bailee of goods which he stores for a compensation. Statutes regulating his charges have been held constitutional, when his business has been considered to be concerned with a public interest. He may give receipts, the indorsement and delivery of which will operate as a transfer of the goods therein described; but such documents are only quasi negotiable.

Warehouse Receipts. See WAREHOUSEMAN.

Warehouse System. Statutory provisions allowing owners of goods, subject to tariff or internal revenue duties, to deposit them in government warehouses for a time, without paying the duties until the goods are withdrawn.

Warfield, BENJAMIN BRECKENRIDGE, D.D., LL.D., b.1851 in Ky. Prof. Allegany, Pa., 1879–87, and Princeton Theol. Sem. since 1887; theological writer.—His brother, ETHELBERT DUDLEY, LL.D., b.1861, pres. Miami Univ., Ohio, 1888, and Lafayette Coll. since 1891, has pub. *Ky. Resolutions of 1798*, 1887.

Warfield, CATHARINE ANN, 1816–1877. Daughter of Nathaniel A. Ware (1780–1854); scholar, traveler, and author; m.1833 in Ky.; novelist and poet, as was her sister, ELEANOR PERCY (MRS. LEE), 1820–1849.

Warfield, WILLIAM, b.1827. American breeder. *Shorthorn Cattle*, 1884; *Hist. Cattle Breeding*, 1889.

Warham, WILLIAM, ab.1450–1532. Bp. of London 1503; Lord Chancellor 1503–15; Abp. of Canterbury from 1503.

Waring, ANNA LÆTITIA, b.1820. English author of a few hymns of great beauty.—Her uncle, SAMUEL MILLER, 1792–1827, pub. *Sacred Melodies*, 1826.

Waring, GEORGE E., b.1833. Col. U. S. Vols. 1861–65; sanitary engineer and author; Street Commissioner of New York 1895–97. *Whip and Spur*, 1875; *Tyrol*, 1879; *Sewerage*, 1888.

Warm-Blooded Animals. Those having a complete circulation of the blood, and its aëration through the medium of lungs at each revolution. Birds and mammals are the only warm-blooded animals.

Warming. Provisions for heating buildings in cold weather. This can be done by open fires or stoves in each room, by hot-air furnaces, by steam direct or indirect, and by hot water, heated by fire or by friction. Open fires heat objects by radiation only, but do not heat the air of a room, except as it is warmed by contact with the warmed objects. Hence rooms to accommodate large numbers cannot be made comfortable in this way, though they ventilate admirably. Stoves do not ventilate, but are very efficient to heat air in rooms by contact. Hot-air furnaces supply fresh air, are easily attended to in a basement area, and are cleanly. Hot water and steam act in the same way, circulating in radiators, and conveying heat to the points at which it is to be radiated (see STEAM HEATING). Water has been heated, where mechanical power which costs nothing is wasted, by means of friction of surfaces in the water which is thus heated and circulated. See VENTILATION.

Warneck, GUSTAV, b.1834. German writer on missions.

Warner, CHARLES DUDLEY, b.1829. American descriptive writer, humorist and novelist, connected with *Harper's Magazine* since 1884. *Backlog Studies*, 1872; *Baddeck*, 1874; *Being a Boy*, 1877; *Irving*, 1881; *Their Pilgrimage*, 1886; *A Little Journey in the World*, 1892; *The Golden House*, 1894. With "Mark Twain" he wrote *The Gilded Age*, 1873.

Warner, HIRAM, 1802–1881. Judge Ga. Supreme Court 1845–53; M.C. 1855–57; Chief-justice 1872.

Warner, OLIN LEVI, 1844–1896. American sculptor.

Warner, SETH, 1743–1784. Officer of Vt. troops 1775–82, distinguished at Crown Point, Ticonderoga, and Bennington.

Warner, SUSAN ("ELIZABETH WETHERELL"), 1819–1885. American novelist. *The Wide, Wide World*, 1850, had an immense popular success. *Queechy*, 1852; *Hills of the Shatemuc*, 1856; *Daisy*, 1868.—Her sister, ANNA BARTLETT, b.1820, wrote *Say and Seal*, 1859, and other novels, alone or jointly with Susan, and pub. *Hymns of the Ch. Militant*, 1858, and *Wayfaring Hymns*, 1869.

Warner, WILLIAM, ab.1558–1609. English poet. *Albion's England*, 1586.

War of 1812. Between the U. S. and Gt. Britain, growing out of a series of wrongs inflicted by Britain, chiefly the search of American vessels for supposed British deserters and their impressment into British service, and the prohibition of American commerce with France, with whom England was at war. The war lasted two years on land and sea, and was concluded with the treaty of Ghent in 1814.

Warped Surface. One which, if rigid, cannot be unwrapped upon a plane.

Warrant. Writing from a competent authority in pursuance of law, directing the doing of an act: addressed to an officer or person competent to do the act, and affording him protection therefor.

Warranty. Agreement, collateral to a contract of sale, that the subject of such sale possesses certain qualities; the breach of it gives the purchaser a right to damages. In some jurisdictions it is synonymous with condition.

Warren. Place for breeding rabbits or game.

Warren, FITZ HENRY, 1816–1878. Brig.-gen. U. S. Vols. 1862–65; Minister to Guatemala 1867–68.

Warren, FRANCIS E., b.1844. Gov. of Wyoming 1882–85 and 1889–90; U. S. Senator 1890–93 and 1895.

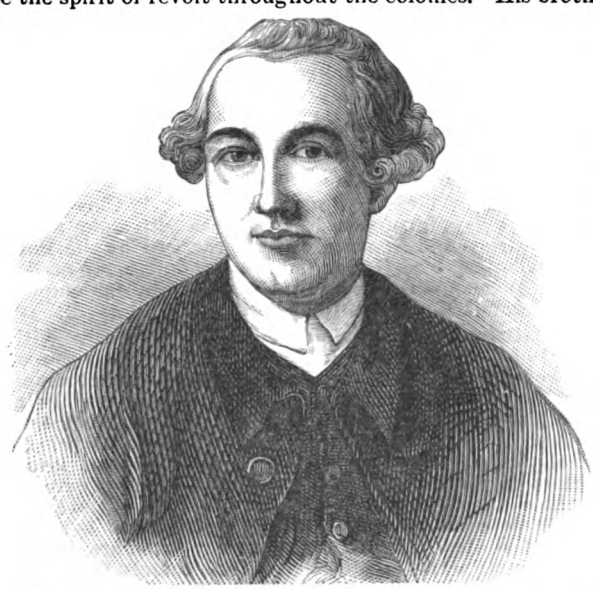
Warren, GEORGE WILLIAM, b.1828. Organist in New York and Brooklyn; composer.

Warren, GOUVERNEUR KEMBLE, U.S.A., 1830–1882. Brig.-gen. U. S. Vols. 1862; Major-gen. 1863–65; distinguished at Gettysburg and in many Va. battles, especially at and after the Wilderness, where he commanded the 5th corps; unjustly relieved, in the moment of victory, by Sheridan, April 1, 1865. As officer of engineers he conducted the survey of the Miss. River, showed that great changes of level had taken place in N. America, and proved that at one time Lake Winnipeg had discharged its waters through the Red River Valley. *Explorations in Dakota*, 1855–58.

Warren, HENRY WHITE, D.D., b.1831. M. E. Bp. 1881; writer on astronomy and the Bible.

Warren, JAMES, 1726–1808. Patriot of Plymouth, Mass., active in committees of correspondence; pres. Mass. Congress from 1775.—His wife, MERCY (OTIS), 1728–1814, pub. poems, two tragedies, and a *Hist. Revolution*, 1805.

Warren, JOSEPH, 1741–1775. Physician and patriot of Boston, eminent for courage, eloquence, energy, and devotion; chairman Committee of Public Safety 1774; pres. Mass. Congress and Major-gen. 1775; killed at Bunker Hill, where he fought as a volunteer, and where his statue was raised 1857. The beauty of his character and the brilliancy of his services to liberty made him the most picturesque hero of the opening conflict: his death, though a national loss, did much to stimulate the spirit of revolt throughout the colonies.—His brother,



Major-general Joseph Warren.

JOHN, 1753–1815, was hospital surgeon 1775–82. Prof. of Anatomy in Harvard from 1783, and pres. Mass. Medical Society from 1804.—His son, JOHN COLLINS, M.D., 1778–1856, studied in Europe, became his father's assistant and successor (1815–47), founded the *Medical and Surgical Journal* 1828, and was eminent as a scholar and operator. He introduced ether 1846.—His son, JONATHAN MASON, M.D., 1811–1867, was a prominent surgeon.—His son, JOHN COLLINS, M.D., b.1842, became prof. Harvard 1887.

Warren, MINTON, b.1850. Prof. Johns Hopkins since 1883; writer on Latin philology.

Warren, SIR PETER, R.N., 1703–1752. Rear-admiral 1745, M.P. 1747. He co-operated with Pepperell and the Mass. troops in the taking of Louisburg, June 1745.

Warren, ROBERT RICHARD, 1817–1897. Irish judge and author.

Warren, SAMUEL, 1807–1877. M.P. 1856–59; novelist. His *Diary of a late Physician*, 1831, and *Ten Thousand a Year*, 1840, were very popular. *Manual of Parliamentary Elections*, 1857.

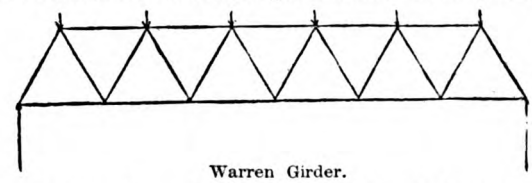
Warren, SAMUEL EDWARD, b.1831. Prof. Rensselaer Inst. 1854–72, and Mass. Inst. of Technology 1872–75; author of textbooks on drawing and geometry.

Warren, SAMUEL PROWSE, b.1841. Organist in New York from 1864; composer.

Warren, WILLIAM, 1812–1888. American actor, long active and prominent in comedy, and held in high regard.

Warren, WILLIAM FAIRFIELD, D.D., LL.D., b.1833. Pres. Boston Univ. from 1873. *Prehistoric World*, 1885; *Quest of the Perfect Religion*, 1887; *Gottlieb*, 1891.

Warren Truss. Bridge truss in which the webbing is formed of members placed in an inclined position between the chords; sometimes called triangular truss. The truss is gener-



Warren Girder.

ally built of equilateral triangles, and the inclination of the bracing to the horizon should never be less than 45°. The figure shows a Warren girder of 6 equal bays in which the inclination of bracing is 60°.

Warrington. Manufacturing borough of Lancashire, Eng., on the Mersey, 16 m. w. of Manchester. Pop., 1891, 55,349.

Warrington, LEWIS, U.S.N., 1782–1851. Captain 1814; distinguished in the War of 1812; chief of ordnance from 1847.

Wars of the United States.

Statement of the Number of United States Troops Engaged.

WARS.	From—	To—	Regulars.	Militia and Volunteers.	Total.*
War of the Revolution	April 19, 1775	April 11, 1783	130,711	164,080	309,781
Northwestern Indian Wars	Sept. 19, 1790	Aug. 3, 1795	.....	.....	8,983
War with France	July 9, 1798	Sept. 30, 1800	.....	.....	†4,593
War with Tripoli	June 10, 1801	June 4, 1805	.....	.....	‡3,330
Creek Indian War	July 27, 1813	Aug. 9, 1814	600	13,181	13,781
War of 1812 with Great Britain	June 18, 1812	Feb. 17, 1815	85,000	471,622	576,622
Seminole Indian War	Nov. 20, 1817	Oct. 21, 1818	1,000	6,911	7,911
Black Hawk Indian War	April 21, 1831	Sept. 31, 1832	1,339	5,126	6,465
Cherokee disturbance	1836	1837	.....	9,494	9,494
Creek Indian War	May 5, 1836	Sept. 30, 1837	935	12,483	13,418
Florida Indian War	Dec. 23, 1835	Aug. 14, 1843	11,169	29,953	41,122
Aroostook disturbance	1836	1839	.....	1,500	1,500
War with Mexico	April 24, 1846	July 4, 1848	30,954	73,776	112,230
Apache, Navajo, and Utah War	1849	1855	1,500	1,061	2,561
Seminole Indian War	1856	1858	.....	3,687	3,687
War of the Rebellion‡	1861	1865	.....	.....	2,772,408
War with Spain	April 21, 1898	.....	.....	.....	.....

* Including all branches of the service.
† Naval forces engaged.
‡ The number of troops on the Confederate side was about 600,000.

See FRENCH AND INDIAN WAR, MEXICAN WAR, UNITED STATES, VOLUNTEERS, WAR, CIVIL, and WAR OF 1812.

Warsaw. Capital of Poland from 1609; on the Vistula; twice taken by Charles IX. of Sweden 1655–56; held by Russia 1793–95 and since 1815; in revolt 1830 and 1863. Depressed for a time, it has much increased of late, and has varied manu-

factures and an extensive trade, with many fine buildings. Its university, founded 1817, suppressed 1832, and reopened 1864, had in 1896 1,335 students and ab. 80 teachers. Pop., 1890, 490,417; 523,133 including military.

Warships. See SHIPS OF WAR.

Warta, or WARTHE. River rising in s.w. Poland, flowing 445 m. n. and w. into and through Prussia, and entering the Oder at Custrin; partly navigable.

Wartburg. Saxon castle near Eisenach, built 1069–72; scene of a poetic contest ab.1207, and of a students' assemblage

Wartburg (restored).

1817; restored ab.1860. Here dwelt for a time St. Elizabeth of Hungary (d.1231), and here Luther was protected May 1521 to March 1522.

Wart-Cress. Low herbs of the genus *Coronopus*, natural family *Cruciferæ*, natives of the Old World, introduced as weeds into America.

Wartenburg, YORK VON. See YORK VON WARTENBURG.

Wart-Hog (PHACOCHÆRUS). African swine, with a broad flat face bearing a pair of warty excrescences on each side, and having the canines of both jaws developed as tusks and curved upward. *P. æthiopicus* of s.e. Africa is 30 in. high, has a reddish-brown skin, scantily hairy, but with a dorsal mane. Its feet have 4 toes each. The teeth become reduced with age, until only one pair of greatly developed molars are left in each jaw. *P. africanus* is widely distributed through s. Africa, but its teeth are not so much reduced in number as in the former.

Wartmann, ELIE FRANCOIS, b.1817. Physicist who wrote much on electricity and magnetism. Prof. Lausanne 1838–46; prof. Geneva 1848.—His father, LOUIS FRANCOIS, b. 1793, wrote on astronomy and meteorology.

Warton, THOMAS, 1728–1790. Prof. Oxford 1757–61, poet laureate 1785. His *History of English Poetry*, 1774–81, is important. *Observations on the Faerie Queene*, 1754; *Poems*, 1802. —His brother, JOSEPH, 1722–1800, headmaster of Winchester School 1766–93, edited Pope and Dryden, and wrote verse.

Warts. Small tumors most commonly situated on the hands, but sometimes found on the feet, face, and ears. They consist of enlarged papillæ of the skin, covered with a thick, hard layer of epidermis. Some are easily removed by almost any of the many remedies suggested, while others seem to resist the action of almost every application. Painting the wart with lactic or glacial acetic acid (repeating if necessary), or the frequent application of a moistened crystal of copper sulphate are among the most promising remedies.

Warville, BRISSOT DE. See BRISSOT DE WARVILLE.

Warwick. Township of R. I., s. of Providence, including sundry manufacturing villages; settled 1642. Pop., 1890, 17,761.

Warwick, GUY OF. Mythical hero of Norman-English metrical romances ab.1150–1350.

Warwick, RICHARD DE BEAUCHAMP, EARL OF, 1381–1439. English courtier, soldier, and diplomatist; regent of France 1425–28 and from 1437; guardian or tutor of Henry VI.—His son, HENRY, 1424–1445, was made Duke of Warwick and "King of the Isle of Wight" 1445.

Warwick, RICHARD NEVILLE, EARL OF, 1428–1471. "King-Maker"; son of Richard, Earl of Salisbury. He married Anne Neville, heiress of Richard, Earl of Warwick, and received the title 1449; secured the crown to his cousin Edward IV. (York); captured Henry VI. (Lancaster) 1465; became disaffected; restored Henry VI. Sept. 13, 1470, and was killed at Barnet.

Wasatch Mts. Range of central Utah, separating the Great Basin from the Col. drainage area. Elevation 9,000 to 10,000 ft., with a few peaks rising to greater altitudes.

Wash. Arm of the sea on e. coast of England, receiving the Ouse and other rivers. Length 22 m., width ab. 15.

Washboards. Boards around the sides of a room at the floor line.

Washburn, EDWARD ABIEL, D.D., 1819–1881. Rector of Calvary Ch., New York, from 1865. *Social Laws of God*, 1874; *Epochs of Ch. History*, 1883; *Poems*, 1883.

Washburn, EMORY, LL.D., 1800–1877. Gov. of Mass. 1853–55; prof. Harvard 1856–76. *Judicial Hist. Mass.*, 1840; *Real Property*, 1860–62; *Study and Practice of Law*, 1871.

Washburn, ISRAEL, LL.D., 1813–1883. M.C. 1851–61; Gov. of Me. 1861–63; collector of Portland, Me., 1863–77.—Of his brothers, CADWALLADER COLDEN, 1818–1882, was M.C. from Wis. 1855–61 and 1867–71, Major-gen. U. S. Vols. 1862–65, serving in the southwest, and Gov. of Wis. 1872–73; CHARLES AMES, 1822–1889, journalist in San Francisco 1853–61, and Minister to Paraguay 1863–68, pub. novels and a *Hist. Paraguay*, 1870; WILLIAM DREW, b.1831, was M.C. from Minn. 1879–85, and U. S. Senator 1889–95; and ELIHU BENJAMIN, 1816–1887, who spelled the name WASHBURNE, was M.C. from Ill. 1853–69, a Republican leader, and U. S. Minister at Paris 1869–77, where he remained during the siege and under the Commune, and rendered eminent services to humanity. *Recollections*, 1887.

Washburn, PETER THACHER, 1814–1870. Reporter Vt. Supreme Court 1844–52; Gov. 1869. *Reports*, 1845–52; *Digest of Cases*, 1845–52.

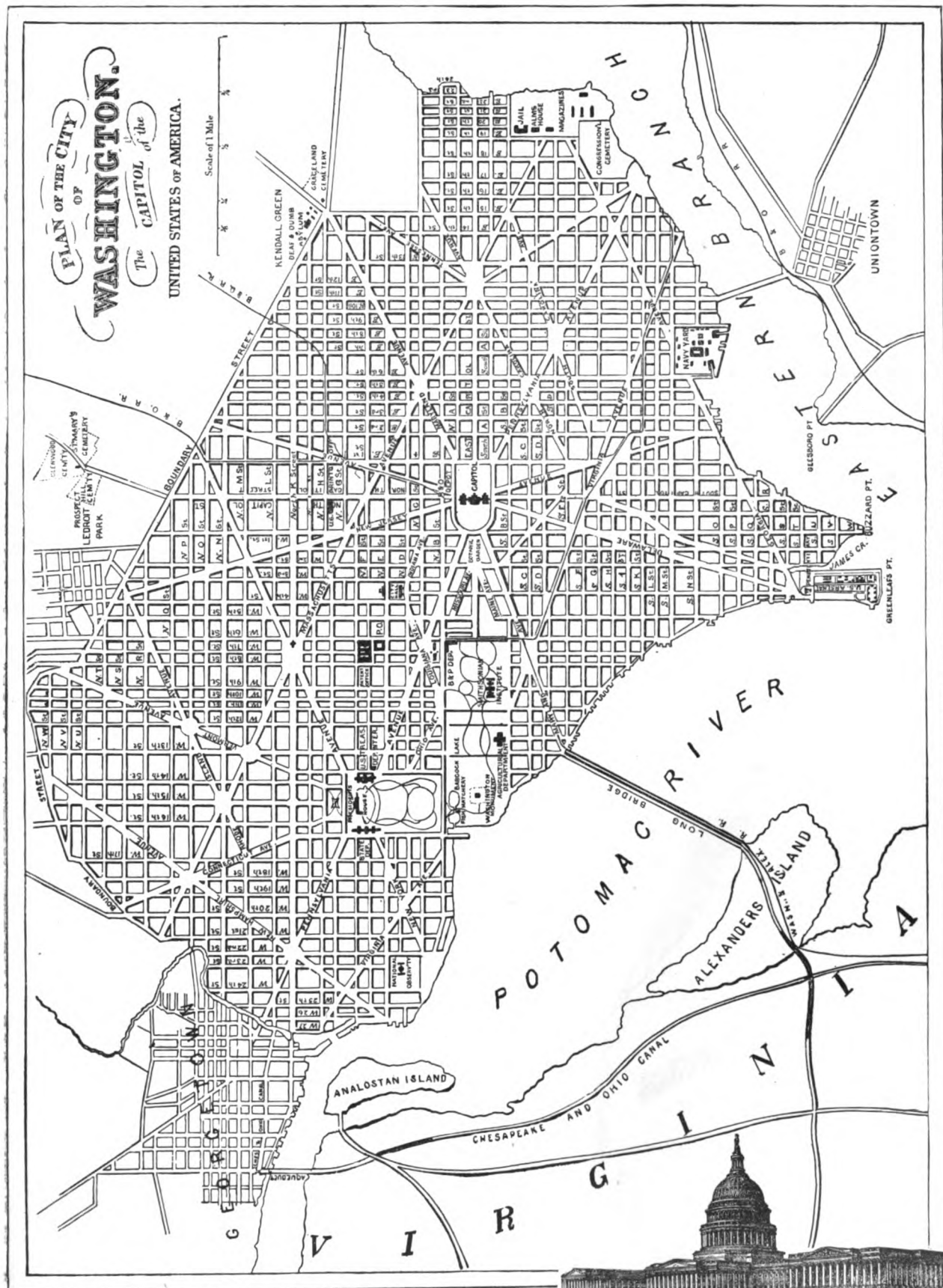
Washburn, WILLIAM BARRETT, LL.D., 1820–1887. M.C. from Mass. 1863–72; Gov. 1872–74; U. S. Senator 1874–75.

Washburn College. At Topeka, Kan.; coeducational; founded 1865. It has 5 professors, 10 other instructors, 119 collegiate students, and a total enrollment of 247.

Washing Machine. For cleaning clothes with soap and water. The oldest methods are the rubbing between the hands, the dashing of the clothes on the water, and the pounding of the clothes on stones. Of the modern machines many varieties are on the market, those rubbing the clothes between corrugated rollers being very common.

Washing of Feet. Practiced from early Christianity to the present day, in supposed accordance with John xiii. 5–14, both in Europe and America. It is practiced by the Pope on Maundy Thursday each year, after a solemn mass, on 12 pilgrims. As a court ceremony it is practiced by the emperor at Vienna, and at Moscow in the Kremlin.

Washington. Capital of the U. S.; coextensive with the District of Columbia, and under immediate jurisdiction of the U. S. government. It is on the left bank of the Potomac, just above the mouth of the Anacostia, and is built mainly in the alluvial bottom land formed by the junction of these two streams. The Potomac is tidal and navigable to this point. The city is planned very regularly, being divided into four quarters, in each of which the n. and s. streets are numbered and the e. and w. streets designated by letters of the alphabet; these streets are crossed obliquely by avenues bearing the names of States. The streets are very wide, are parked on the sides or in the middle, and paved mainly with asphalt. Water is supplied by gravity, being taken from the Potomac at the head of Great Falls and brought to the city in an aqueduct; the supply is excellent and abundant. The public buildings are numerous, scattered widely over the city, and mostly fine architectural works. The Capitol, on an eminence at the nominal center of the city, is admirably adapted to its uses in all respects. Others are the Interior, Agricultural, Treasury, Post-Office, State, War, and Navy Departments, National Museum, Pension Office, Smithsonian Institution, Bureau of Engraving and Printing, Government Printing Office (the largest in the world), Observatory, Navy Yard, Arsenal, and Congressional Library. The W. Monument is a plain shaft of marble 555 ft. in height. W. is a city of parks. It contains numerous public squares and circles scattered widely over the city, most of them embellished by statuary, flower-beds, and fountains. The Soldiers' Home Park lies outside the city on the north, has an area of 500 acres, and contains the National Soldiers' Home. The city has little commerce or manufactures beyond what is required for the support of its inhabitants. In a legal sense, there is no city of W., its charter having been



The Capitol at Washington.

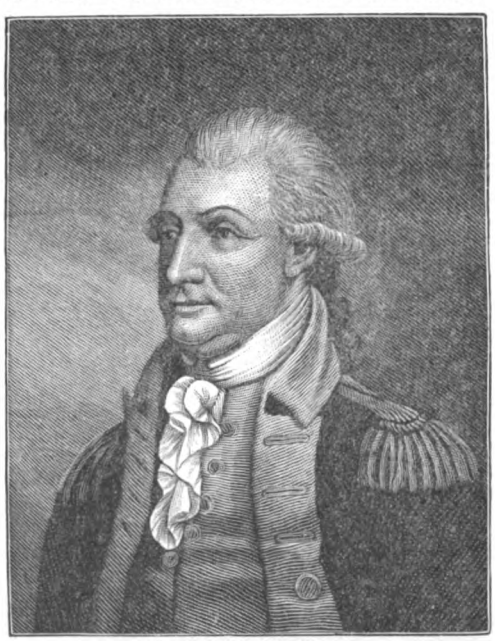
abolished 1874 and the government centered in that of the District, which is governed by 3 commissioners appointed by the President. The inhabitants have no voice in the management of affairs. Its growth was very slow, and the present beautiful city has been mainly built since the Civil War. It was accepted as the site of the national capital 1790: the boundaries of the city, with the location of the public squares, were determined 1791, by Washington; he called it The Federal City, but after his death it was named in his honor; the capital was moved there in 1800. It was laid out after the plans of a French engineer, and is modeled somewhat after the form of Versailles. The White House, the Presidential residence, stands in the w. part. on Pa. Avenue. W. is the most cosmopolitan of American cities, every civilized nation being represented in it. Pop., 1890, 230,392, of which about one-third were colored. Area 64 sq. m. (See Map, p. 1633.)

Washington. Most northwestern of the States. Its area is 69,994 sq. m. Along the w. coast are ranges or groups of mountains of no great height; e. of them is a depression or valley descending from Puget Sound through to the Columbia, in continuation of the Willamette valley of Oregon. Still further e. rises the Cascade Range, broad and plateau-like, surmounted by volcanic cones. The e. part is mainly occupied by the Great Plains of the Columbia, grass-covered but treeless. The industries are mainly agricultural. The State has become prominent as a source of wheat supply. The capital is Olympia. In 1592 the Strait of Juan de Fuca was discovered by a Greek pilot of that name. In 1789 an exploration of the inland waters was made by Capt. Kendrick, and in 1792 the Columbia was explored by Capt. Gray. The expedition of Lewis and Clark was fitted out 1803 by the U. S. to obtain a further knowledge of the interior. The history of the Territory was for a long time hardly more than that of the fur-trading company of J. J. Astor, the Northwest Fur Co., and the Hudson's Bay Co. The present State was originally a part of one territory including also Oregon and Idaho. W. was set off as a separate Territory 1853 and admitted as a State 1889. Pop., 1890, 349,300. (See Map, p. 1635.)

Washington, BOOKER TALIAFERRO, b.1856 in Va. as a slave; educated at Hampton. Founder (1881) and pres. of Tuskegee Institute, Ala., which under his guidance has grown to great proportions, and done an immense work in the industrial, mental, and moral education of the colored people.

Washington, BUSHROD, LL.D., 1762–1829. Nephew and heir of George; Associate Justice U. S. Supreme Court from 1798. *Reports of Va. Court of Appeals*, 1798–99; *U. S. Circuit Court Reports*, 4 vols., 1826–29.

Washington, GEORGE, 1732–1799. First President of the U. S.; born in Westmoreland co., Va. At 16 he was employed to survey the wilderness in the district of the Allegany Mts. During the war with the French and Indians he held important commands. He was attached to Gen. Braddock's staff



George Washington.

during his disastrous campaign of 1755, and was the only aid not killed or wounded: the Indians believed he had a charmed life. At the close of this war, 1759, he retired to private life, married Mrs. Martha Custis (1732–1802), and lived on his estates at Mt. Vernon, Va., until the beginning of the Revolution. At the news of the battle of Lexington he was appointed commander-in-chief of the Continental army. Thenceforth his history is that of the country. The management of the war was mainly in his hands, and its final success was chiefly due to his wisdom, valor, and public spirit. As President, 1789–97, he guided the new State through its first dangers, holding the balance between Federalists and Republicans, and avoiding foreign strife. His last years were spent at Mt. Vernon. His greatness lay in the even poise of many qualities: in dignity, purity, and disinterestedness he is the model of a public man. As the liberator of his country from a foreign yoke he ranks with Judas Maccabæus; as its "father," William the Silent alone has equal eminence.

Washington, JOHN MARSHALL, U.S.A., 1797–1853. Major 1847; distinguished at Buena Vista.

Washington, WILLIAM, 1752–1810. Cousin of George; Revolutionary officer, in active service 1776–82; distinguished especially at Cowpen's and Hobkirk's Hill; Brig.-gen. 1798.

Washington, MT. Highest peak of the White Mts., in N. H. Altitude 6,293 ft.

Washington, TREATIES OF. 1. June 12, 1846, defining the n.w. boundary of the U. S. and British America. 2. 1854, regulating trade with Canada; known as the "Reciprocity" treaty. 3. May 8, 1871, respecting the Alabama claims, San Juan boundary, and fishery disputes, and prescribing the duties of neutral States.

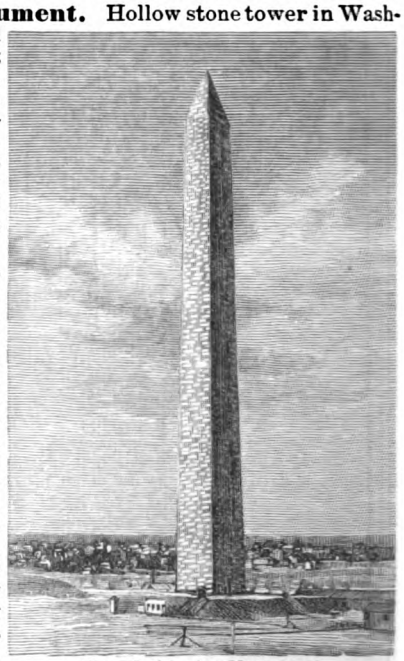
Washington, UNIVERSITY OF. At Seattle, Wash.; opened 1862. Congress assigned two townships 1854, and the State appropriated 100,000 acres 1893. It has 18 teachers and nearly 500 students.

Washington and Jefferson College. At Washington, Pa.; formed 1865 by the union of Washington Coll., chartered 1806, and Jefferson Coll., at Cannonsburg, Pa., chartered 1802. It is non-sectarian; has 13 teachers and ab.300 students.

Washington and Lee University. Outgrowth of Augusta Academy, founded 1749, known as Liberty Hall 1776–97; at Lexington, Va., since 1780; chartered 1782; called Washington Coll. 1797. It received various gifts, was revived 1865 with Gen. R. E. Lee as pres., and took its present name 1870. It has schools of arts, engineering, and law, 14 professors, 5 instructors, ab.200 students, and a library of 30,000 vols.

Washington Bridge. Highway bridge over the Harlem River at 181st Street, New York, completed 1890; remarkable for its long spans and its architectural beauty. The two main arches are each 510 ft. in span and 92 ft. in rise; the approaches to these consist of stone arches. Its cost was $2,850,000. The chief engineer was Wm. R. Hutton. See BRIDGES.

Washington Monument. Hollow stone tower in Washington, D. C., completed 1885. It is 55 ft. square; the walls are 15 ft. thick. At the top is a pyramid, capped with an aluminium tip. It is 555 ft. high, and the tallest structure ever made by man, except the Eiffel tower. The weight is 90,854 net tons.



The Washington Monument.

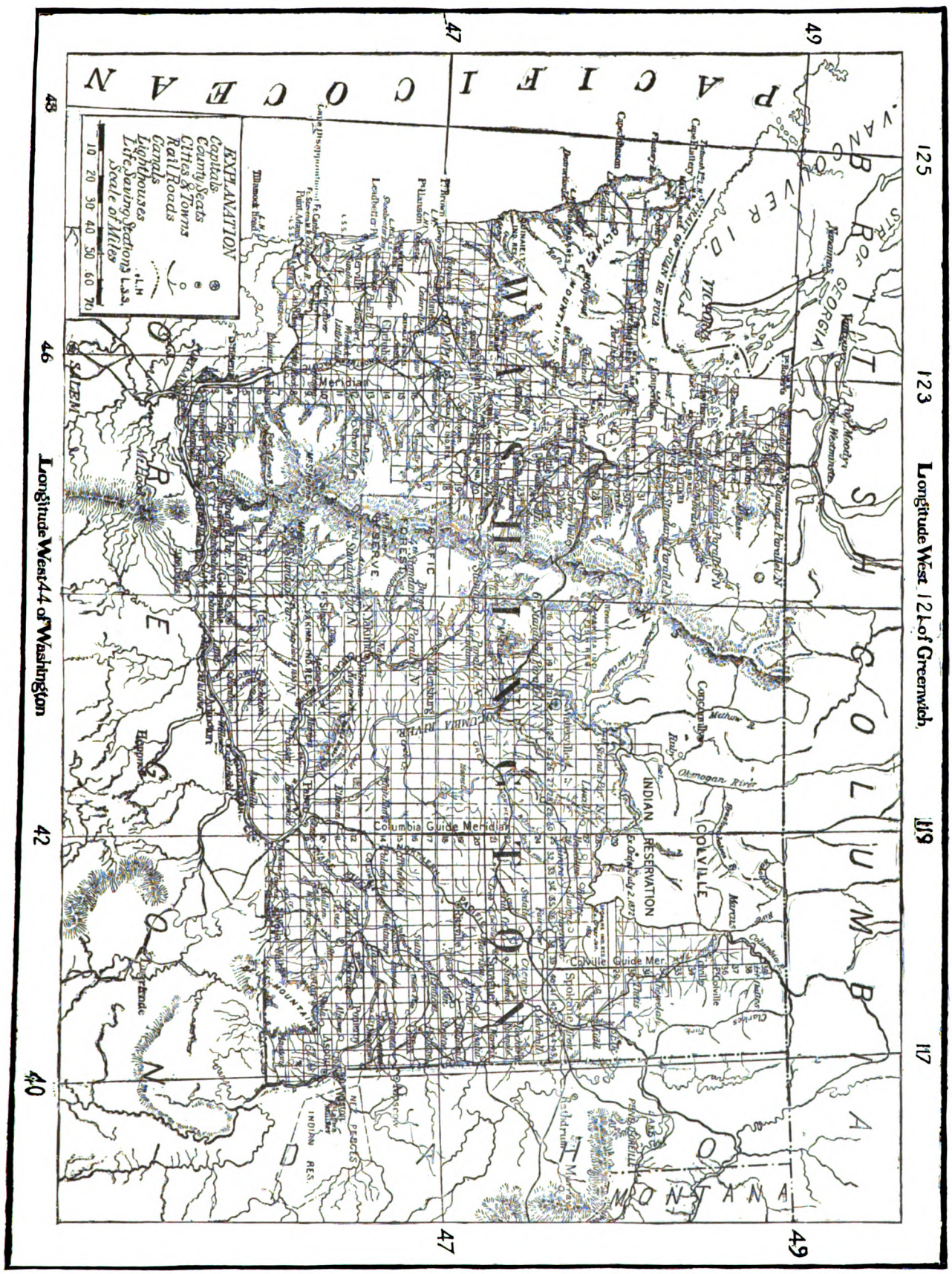
Washington University. At St. Louis, Mo.; chartered 1853, opened 1859. The law school was opened 1867, the polytechnic 1870, that of fine arts 1879. The medical coll. (founded 1842) became a part of it 1891, the dental coll. 1892. It has over 100 instructors, with 151 collegiate students, 274 in fine arts, 165 in law, 85 in medicine, and 90 in dentistry. Including secondary and training schools, it has (1897) a total of 175 teachers, and 1,823 pupils.

Washita, or **Ouachita,** RIVER. Left hand branch of the Arkansas, in Ark. and La. Drainage area 20,764 sq. m., length ab.600 m. It is navigable to Arkadelphia.

Wasielewski, JOSEPH VON, 1822–1896. German violinist and historical writer, of Polish descent.

Wasp. See FOSSORIA and VESPIDÆ.

Wassail. Drinking bowl used in the celebration at New


125
123
Longitude West 121 of Greenwich
119
117
49
47
48
46
Longitude West 44 of Washington
42
40
PACIFIC OCEAN
STRAIT OF JUAN DE FUCA
VANCOUVER I.
STRAIT OF GEORGIA
WASHINGTON
OLYMPIA
SPOKANE
COLUMBIA
MONTANA
IDAHO
SALEM
Columbia Guide Meridian
Colville Guide Mer.
Okanogan River
COLVILLE INDIAN RESERVATION
Spokane
Colville
Meridian
Ellensburg
Yakima
Walla Walla
Pullman
Cheney
Ritzville
Waterville
Wenatchee
Chelan
Okanogan
Conconully
Republic
Newport
Ione
Metaline
Leadpoint
Tacoma
Seattle
Port Townsend
Port Angeles
Aberdeen
Hoquiam
Olympia
Shelton
Bellingham
Anacortes
Friday Harbor
Coupeville
Port Orchard
Port Gamble
Port Ludlow
Port Blakely
Port Madison
Port Orchard
Port Townsend
Port Angeles

Year. A survival exists in the loving cup, which is passed from hand to hand around the guests at dinners.

Wasson, DAVID ATWOOD, 1823–1887. Successor of Theodore Parker in Boston 1865–66; poet.

Waste. Damage to land by a tenant, injurious to the owner. If caused by the tenant's act it is voluntary; if by his negligence, permissive. Liability for waste has been modified by modern statutes.

Waste Weir. Overflow from a reservoir, built to let off the water that rises above a certain level. Its length should be sufficient to discharge all surplus water in times of flood. See JOHNSTOWN FLOOD.

Wasting Palsy. Progressive muscular atrophy.

Watch. On shipboard, that set of men which have charge of the ship while others rest. Day and night are divided into watches of 4 hours each, except from 4 to 8 P.M., in which they are 2 hours each. See DOG-WATCH. The object of the dog-watch is to change the hours of the men, so that the same set is not on duty at the same hours every day.

Watch. Time-keeper actuated by a spring, and capable of being carried on the person. They are said to have been first invented at Nuremberg 1477, although it is claimed that Robert, King of Scotland, had a watch ab. 1310. Watches are now made by machinery. See HOROLOGY.

Watch Night. Last night of the old year. Some churches have religious services until midnight when the church bell is sounded, announcing the advent of the New Year.

Water. H_2O. Found as such on the earth's surface, and in all plants and animals; as water of CRYSTALLIZATION (q.v.); as vapor in the atmosphere, and in the earth's crust. It is formed whenever hydrogen or compounds containing hydrogen, as wood and coal, are burned. Rain water collects many impurities from the air as it falls; it usually contains particles of dust, plant and animal organisms, dissolved gases, small quantities of nitric and nitrous acid, and ammonia. Spring waters always contain foreign substances; the dissolved substances vary in quality and quantity according to the locality. Lake and river waters are often contaminated by the sewage of towns upon their banks, and are never free from bacteria, many of which are wholly unobjectionable. The Mich. standard of purity of water for domestic use is as follows, in parts per million: total residue not over 500; earthy bases 200; sodium chloride 10; sulphates 100; organic matter not reduce more than 8 pts. potassium permanganate; free ammonia .05; albuminoid ammonia .15; nitric acid .5; nitrous acid not enough to be estimated; toxicogenic germs none. Sea water contains a large number of salts. See SALT WATER; also FILTERS and SPRING. The following analysis is by Von Bibra:

	Atlantic Ocean.	Dead Sea.
Specific gravity	1.0275	1.17205
Chloride of sodium	1671.34	6702.73
" " potassium	——	682.63
" " ammonium	——	3.35
" " calcium	——	1376.75
" " magnesium	199.66	4457.23
" " aluminium	——	31.37
" " iron	trace	1.50
" " manganese	——	3.35
Bromide of sodium	31.16	156.53
Iodide of sodium	trace	trace
Sulphate of potassium	108.46	——
" " magnesium	34.99	——
" " calcium	93.30	38.07
Phosphate of sodium	trace	——
Carbonate of calcium	"	trace
Silver	"	——
Copper	"	——
Lead	"	——
Arsenic	"	——
Silica	"	trace
Organic matter	"	34.59
Bitumen	——	trace
Total in 1 U. S. gallon	2138.91grs.	13488.10grs.
Percentage by weight	3.569	19.733
Water	96.431	80.267
	100.00	100.00
Weight of 1 gallon	59922.grs.	68352.grs.

Water, WEIGHT OF. The weight of a cubic foot of fresh water is generally taken at 1,000 oz. or 62½ lbs., but this is slightly in excess of the true value. For distilled water the following are the weights per cubic foot at different temperatures:

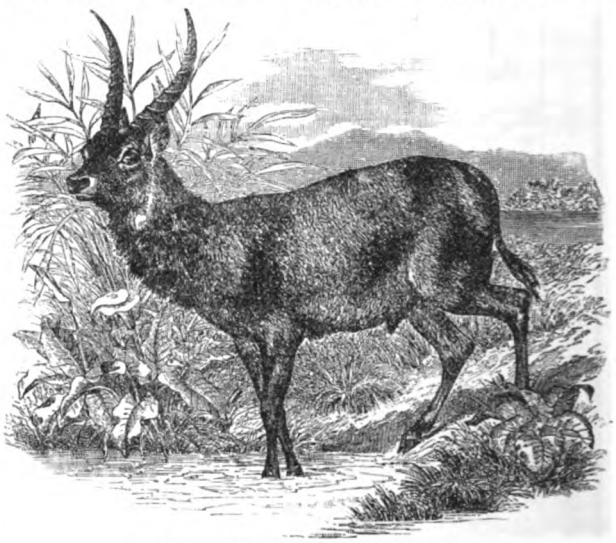
At 39° Fahrenheit	62.42	lbs.
" 50° "	62.41	"
" 60° "	62.37	"
" 100° "	62.00	"
" 212° "	59.84	"

Water Battery. Permanent fortification, located near the level of the water and armed with high powered guns for the defense of a channel or harbor.

Water Bed. Contrivance similar to the air bed, and used to prevent bed-sores.

Water-Beetle. See DYTISCIDÆ.

Water-Bok (KOBUS). S. African antelope, thick-set, with stout legs, coarse brownish gray hair, a height of 5 ft., and



Water-Bok (*Kobus ellipsiprymnus*).

having horns 30 in. long. These animals frequent the neighborhood of water. They go in herds of ab. 20, consisting either of young males or of females led by one old male.

Water Brash. Symptom in some dyspepsias, where there is a regurgitation, which may be insipid, salty or even acid, when the stomach is presumably empty of food. Numberless remedies have been suggested; the attempt at cure must include the discovery and removal of the cause.

Waterbury. City of New Haven co., Conn., on Naugatuck River. It has extensive manufactures, especially of brass work, clocks and watches. It was settled 1677 and chartered 1853. Pop., 1890, 28,646.

Waterbury, DAVID, 1722–1801. Brig.-gen. of Conn. troops 1776.

Water Chinquepin. See NELUMBO.

Water Clock. See CLEPSYDRA.

Water Colors. Pigments ground with water and gum, or size, which preserve their consistency in a solid cake when dried and which can be mixed with water by rubbing them on a moistened palette.

Water Courses. Natural flow of water in streams, considered as a subject of a legal interest or right vested in owners of land affected. The term does not apply to a line of discharge, natural or artificial, which is not the usual channel of flow.

Water Cress. See CRESS, WATER.

Water-Culture. Process of growing plants in water which carries known amounts of mineral salts in solution.

Water Cure. See HYDROPATHY.

Water Equivalent. Amount of water which has the same heat capacity as the calorimeter, stirrer, and thermometer; added to the total amount of water in the calorimeter in experiments in specific and latent heat.

Waterfalls. Falls of water from a height, most frequently occurring in mountainous country, where the streams from the mountain sides enter the valley. They change their ap-

pearance yearly owing to the wearing away of the rocks. Among the principal waterfalls are the following:

Yosemite (3 plunges)	2,660	feet.
Roraima Fall, Guiana (2 plunges)	2,000	"
Grand Falls, Labrador	2,000	"
Sutherland Falls, New Zealand (3 plunges)	1,904	"
Kukenam Fall, Guiana (sheer plunge)	1,500	"
Gavarnie Fall, Pyrenees	1,308	"
Staubbach, Switzerland	866	"
Kaieteur Falls, Guiana	740	"
Victoria Falls, Zambesi	400	"
Shoshone, U. S.	210	"
Foyers, highest in Britain (2 plunges)	205	"
Hay River, Alaska	200	"
Niagara	169	"

Water-Feather. Water violet. See FEATHERFOIL.

Water Flea. See DAPHNIA.

Waterford. Town of s. Ireland, on the Suir, 97 m. s.s.w. of Dublin; taken and fortified by Strongbow 1171. It has a good export trade. Pop., 1891, 21,693.

Waterford, LOUISA, MARCHIONESS OF, 1818–1891. Painter and illustrator.

Water-Gas. This is a much used kind of illuminating gas, which has largely replaced coal-gas. Steam is passed through a bed of red-hot anthracite or coke, thus producing a mixture of hydrogen and carbonic oxide gases, which is fuel-gas, and not luminous. This gas then passes through a superheater, where it mixes with the vapor of naphtha or petroleum, which is decomposed by the high temperature into permanent hydrocarbon gases, and the mixture becomes luminous. The resulting gas is passed through condensers, to remove the vapors, and through purifiers containing iron oxides to remove the sulphur. There are many modifications of the apparatus. 40 lbs. of anthracite and 5 gals. of naphtha are required per 1,000 cu. ft. of gas, and much less labor than for coal-gas. The fuel-gas, approximately, consists by volume of hydrogen 50, carbonic oxide 40, marsh-gas 2, carbon dioxide 3, nitrogen 5. The finished gas contains hydrogen 29, carbonic oxide 31, marsh-gas 23, illuminants 14.5, nitrogen 2, oxygen 0.5. The luminosity is about 26 candle-power. There is no tar or ammonia of value produced in this process. Although patents for water-gas processes date as far back as 1823, the manufacture was not successful until 1874; in 1889, of the total number of gas-works, 26 per cent made water-gas. Fuel-gas has been used for heating somewhat. Coal-gas was first used for lighting in Cornwall 1792, and the Gas-light Company of London was chartered 1809. In 1822 the Boston Co. was chartered, and in 1823 the New York Co., which went into operation in 1827. See COAL-GAS and ILLUMINATING GAS.

Water-Glass. See SODIUM SILICATE.

Water Hammer. Shock caused when a column of water in motion is suddenly brought to rest. The living force of the incompressible fluid has to be absorbed at the point to which the mass of water was moving, and the impact is like a blow. When steam or air is mixed with the moving column, the snapping or cracking is very pronounced, as the less dense fluids move quicker than the dense water, and if the pipes are cool enough with a steam water mixture to condense the steam so that a mass of the water is impelled into a vacuum by the expansive force of steam behind it, the blow is so severe as to endanger metal pipes and fittings and cause disasters. See AIR CHAMBER, CONCUSSIVE EBULLITION, and HYDRAULIC RAM.

Waterhen. See MOOR HEN.

Water Hog. See CAPYBARA.

Waterhouse, ALFRED, b.1830. English architect, R.A. 1885.

Waterhouse, BENJAMIN, M.D., 1754–1846. Prof. Harvard 1783–1812; pioneer of vaccination 1799; writer on medicine, botany, and politics.

Water Jet. Jet forced through a pipe for the purpose of sinking a pile by loosening the sand around its foot. See PILE DRIVER.

Waterland, DANIEL, D.D., 1683–1740. Archdeacon of Middlesex 1730; active in controversy. *Hist. Athanasian Creed*, 1724; *Eucharist*, 1737.

Waterleaf. Herbs of the genus *Hydrophyllum*, natural family *Hydrophyllaceæ*, natives of N. America.

Water-Legs. Those parts of a fire-box boiler which surround the fire, and on which the weight of that end of the boiler is borne. They are double, with a space of 4 or 5 in. between, filled with the water to be evaporated. When of large diameter or flat, the water-leg sheets are stay-bolted. The closure at the bottom is made by a mud-ring of heavy rectangular iron, or the inner plate is riveted to the outer by a Z-flange. Hand-holes should be made in water-legs.

Water-Lily. Aquatic herbs of the genus *Castalia* (*Nymphæa*), of the natural family *Nymphæaceæ*, bearing showy flowers; natives of the n. temperate and tropical zones; known

White Water-lily (*Castalia alba*).

also as Water-nymph. The root-stocks of the white water-lily contain gallic acid and have been used for dyeing. See LOTUS and VICTORIA REGIA.

Water-Lily, YELLOW. Yellow-flowered, aquatic herbs of the genus *Nymphæa* (*Nuphar*), of the natural family *Nymphæaceæ*, natives of the n. temperate zone; known as Pond Lily.

Waterloo. Belgian village, 11 m. s. of Brussels; site of the decisive battle, June 18, 1815, between the French under Napoleon, 72,000 men and 246 guns, and the Allies under Wellington, 68,000 men and 156 guns, re-enforced toward evening by the Prussians under Blücher, 50,000 men and 104 guns. The French lost 37,000 killed, wounded and prisoners, the Allies 23,000. Napoleon fled to Paris, and abdicated the second time June 22.

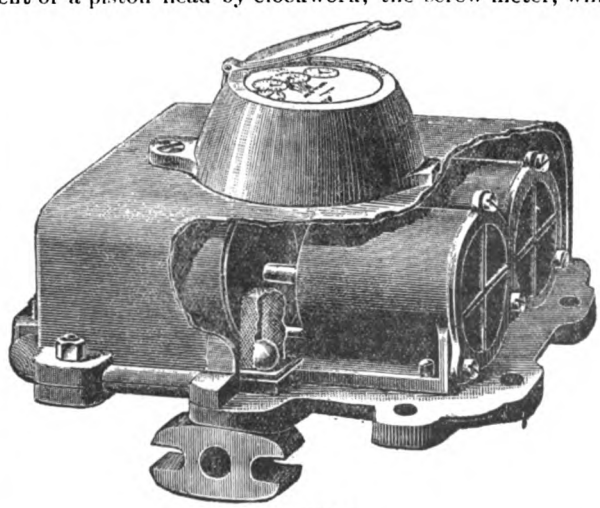
Waterman, ROBERT WHITNEY, b.1826. Gov. of Cal. 1887.

Waterman, THOMAS GLASBY, 1788–1862. Lawyer of Binghamton, N. Y. *Justice's Manual*, 1828.—His son, THOMAS WHITNEY, b.1821, edited many law books.

Water Mark. Impression, wrought in paper during the process of manufacture, by means of wire or brass plates on the hand mold or the dandy-rollers of the paper-machine.

Watermelon. *Cucumis citrullus.* Trailing vine of the natural family *Cucurbitaceæ*, extensively cultivated in warm and temperate countries for its large fruit.

Water Meter. Apparatus for measuring and registering the amount of water that flows through a pipe. There are four kinds: the piston meter, which registers the displacement of a piston head by clockwork; the screw meter, which



Water Meter.

has screw blades attached to a shaft and is surrounded by a cylinder; the wabbling-disk meter, in which the clockwork is moved by a pin attached to a disk; and the Venturi meter, in which the pipe is contracted so as to produce differences of

pressure. All meters must be rated so as to determine their discharge by actual test.

Water-Mole. 1. Desman; two species of aquatic moles of the genus *Myogale*, inhabiting s.e. Russia and the Pyrenees respectively. The former is 16 in. long, has a strong scaly tail, webbed feet, and the upper jaw is extended as a proboscis. 2. ORNITHORHYNCHUS (q.v.). See SORICIDÆ.

Water Motor. Small water wheel, designed to furnish a light power. See OVERSHOT WHEEL, TURBINE, and UNDERSHOT WHEEL.

Water-Net. Small reticulated fresh-water *Algæ*, the *Hydrodictyon utriculatum*.

Water Oats. See RICE, WATER.

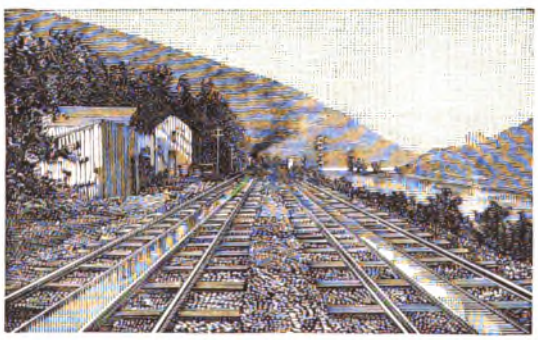
Water of Crystallization. Many substances in crystallizing from aqueous solutions combine with a portion of water; *e.g.*, copper sulphate ($CuSO_4.5H_2O$) and sodium carbonate ($Na_2CO_3.10H_2O$). Upon heating these substances, the water is readily given off and the crystals lose their original form.

Water Opossum (YAPOK, *Chironectes*). Aquatic marsupial of Guiana and Brazil. Its pouch is well developed, and its habit of life is similar to that of a muskrat. It lives on fish, and brings forth half a dozen young in a litter in a burrow, which opens below the surface of the water of a stream, etc.

Water Ouzel. See OUZEL.

Water-Pepper. See SMARTWEED.

Water Pick-up. Arrangement to enable the water tanks upon locomotive tenders to be filled while the train is in motion; due to Ramsbottom. A trough of boiler-plate iron, 4 in. deep, 18 in. wide, and a quarter mile long, lies between the rails. This is filled with water from a source of supply, and is kept from freezing in winter by steam pipes in the corners of the trough. The tender has an inclined rectangular pipe, curved



Feed Water Trough.

toward its mouth to come down and enter the water like a scoop at its lower end. As the scoop end enters the water and is moved forward through it by the motion of the train, the inertia of the water compels it to follow the incline of the back of the pipe, and forces it upward until it falls over the top of the pipe into the tank. Best speed is ab. 20 m. per hour. Considerable water wastes sidewise over the trough.

Water Pipes. House service pipes are made of lead and wrought-iron, and sometimes of brass. Mains for carrying water through the streets of towns are cast-iron, and range in diameter from 3 to 60 inches; they are cast in lengths of 12 ft. and united by a bell and spigot joint. Pipes for conveying water from reservoirs to towns are generally of cast-iron, but steel pipes made of plates riveted together have come into use since 1890; the largest steel pipe is one of 60 in. diameter at Allegany, Pa. Wooden pipes made of red-wood staves bound with steel bands are frequently used on the Pacific slope. Cast-iron and steel pipes are coated internally with coal tar or asphalt to prevent corrosion. See PIPE LINES.

Water-Pore. Degenerate stoma at the extremity of a vascular bundle in the leaves of many plants, allowing the escape of water.

Water Power. Power derived from a wheel driven by water. One horse-power can be theoretically obtained by the fall of 33,000 lbs. of water per minute through a vertical distance of one foot. It is estimated that the rivers of the U. S. can furnish ab. 200,000,000 horse-power, of which less than one-hundredth part is actually utilized. The cost of water power per annum ranges from $10 to $20 per horse-power.

Water Proofing. Process of rendering textile fabrics and other substances impervious to water. This is accomplished by treating the substance with india-rubber, by means of double decomposition of alum and soap, or of tannic acid and gelatin. Chinese waterproof paper is made by treating it successively with solutions of glue and potassium dichromate, the gelatin being thus rendered insoluble.

Water Ram. Sudden shock produced in a pipe when a valve is quickly closed, the pressure thus produced being often much greater than the static pressure. To avoid it valves should be arranged so that they cannot be suddenly closed.

Water-Rat. 1. *Arvicola amphibius*, the European Water-Vole (see VOLES). 2. American Muskrat (see MUSKRAT).

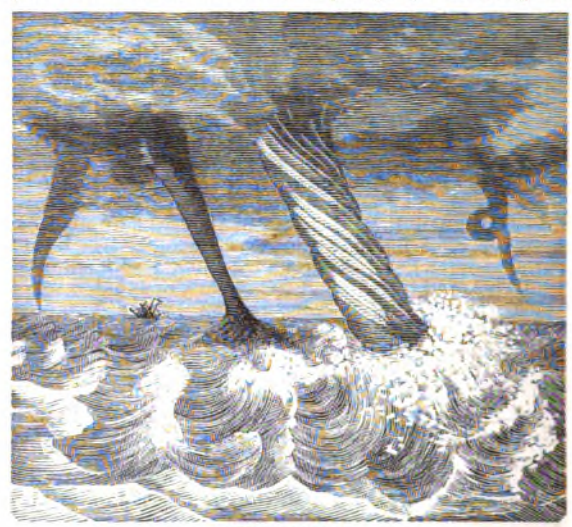
Water Rice. See RICE, WATER.

Watershed. Area drained by a stream.

Water-Snakes (see also SEA-SERPENTS). The families represented here are the *Natricidæ* and *Homalopsidæ*. Members of the former family swallow their prey alive, and can be made to disgorge them before they are dead. *Tropidonotus* is a common genus, including the Water Moccasin (not the poisonous *Ancistrodon*), which may attain a length of 3 ft.; it is harmless, though a fierce fighter when cornered. *Macrophthalmus* of India mimics the venomous Cobra almost perfectly in form, color, and habit of flattening the neck. *Eutenia*, the Garter Snakes, are also included; they are not confined to the water. Some species of *Tropidonotus* can remain under water for hours.

Water Spaniel. One of the several breeds of SPANIELS (q.v.).

Water Spout. Appearance as if water were flowing from a cloud to the earth, or inversely, in a nearly vertical column; really due to the existence of a very rapidly revolving slender



Waterspouts.

cylinder of air, having a core of very low barometric pressure, up which spray is drawn from the center, and within which cloud or mist is formed by expansion and cooling of the air that is drawn into it.

Water Supply. Ab. 100 gallons per person per day are required for the supply of a town. A gravity system collects water in a storage reservoir, from which it is distributed to the town through pipes. Pumping systems are employed when the supply is obtained from a lake or river whose elevation does not permit distribution by gravity. Pumping to a stand-pipe or to a reservoir is the most common method, while direct pumping into pipes is used in some towns. For fire service an effective pressure of 60 to 80 lbs. per square in. is desirable in the pipes.

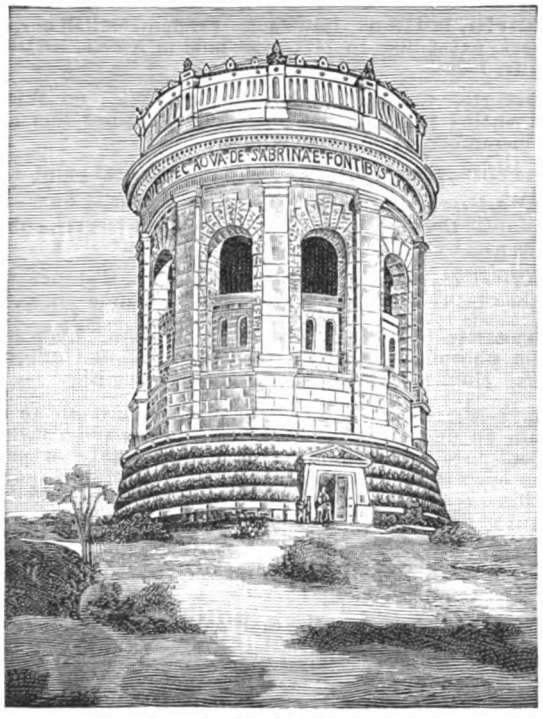
Water-Table. 1. Course of stone with an inclined front, around the base of a building. 2. Partition thrown across the fire-box of a locomotive boiler, so as to form a combustion chamber above and behind it (see COMBUSTION CHAMBER, FIRE-BOX, LOCOMOTIVE, and SMOKE-ARCH). It is double, like the water-legs, and of same depth, and is in direct communication with the water in these legs and at the front. The gases pass through a hole, made in it as the fire-door opening is made, and so become mixed with air.

Water-Tight Compartment. See BULKHEAD.

Water-Tissue. Modification of parenchyma, found in succulent plants, whose cells are filled with sap.

Waterton, CHARLES, 1782–1865. English naturalist and traveler. *Wanderings in S. America,* 1825; *Essays on Natural History,* 1838–44.

Water Tower. Vertical pipe into which water is pumped in order to produce a pressure head in the street mains;



Water Tower.

often called Stand Pipe. This prevents pulsation of the water in the distributing pipes, and, for small towns, acts as a reservoir.

Watertown. Capital of Jefferson co., N. Y., on Black River, near Lake Ontario; settled 1800, chartered 1869. It has varied manufactures. Pop., 1890, 14,725.

Water-tube Boilers. The water is inside of tubes, and the fire outside. They are less likely to become clogged with ashes and flue-dust, and favor rapid circulation; the heating surface is efficient. In foul or scaling waters the deposits give trouble; in many forms, to repair a tube at the middle of a group involves emptying and cooling the boiler, and an awkward process of renewal. Forced circulation increases the efficiency of such boilers. See BOILERS, COIL BOILERS, GALLOWAY BOILERS, and SECTIONAL BOILERS.

Waterville College. See COLBY UNIVERSITY.

Watervliet Arsenal. Established by the U. S. Government at W. Troy, N. Y., 1807, on a reservation of 109 acres. Here are manufactured field and siege ordnance, shot and shell, gun-carriages, ammunition and equipments for the U. S. army.

Waterweed. *Philotria canadensis.* Small, submerged, aquatic herb of the natural family *Hydrocharideæ,* native of N. America; naturalized in Europe.

Water-Wheel. See BREAST-WHEEL, CENTER-FLOW WHEEL, OVERSHOT WATER-WHEEL, TURBINES, and UNDERSHOT WHEEL.

Water-Willow. *Dianthera americana.* Narrow-leaved, aquatic herb of the natural family *Acanthaceæ,* native of e. N. America.

Water Works. The first public water supply in the U. S. was a gravity reservoir constructed at Boston, Mass., 1652; the second one was a pumping system built at Bethlehem, Pa., 1754. In 1800 there were five water works in the U. S.; in 1850 there were 68, and in 1880 there were 629. In 1890 the number was 2,037, of which 588 were gravity systems and 1,449 pumping systems. In 1897 the number had increased to 3,196, of which 1,690 were owned by towns and cities and 1,506 by private parties; these works furnished both domestic supply and fire protection to 3,480 towns. See AQUEDUCT, DAMS, PIPE LINES, PUMPING ENGINE, RESERVOIR, WATER PIPES, WATER SUPPLY, and WATER TOWER.

Waterwort. Insignificant aquatic herbs of the genus *Podostemon,* natural family *Podostemaceæ,* of wide geographical distribution.

Watkin, SIR EDWARD WILLIAM, b.1819. M.P. from 1864; knighted 1868; promoter of railways, parks, and the Channel tunnel.

Watkins Glen. Summer resort in Schuyler co., N. Y., near Seneca Lake. It has precipitous sides and many cataracts.

Watling's Island. One of the Bahamas, supposed to be Guanahani or San Salvador, first touched by Columbus.

Watling Street. Roman road from Dover to London, Chester, and York, thence branching n.w. and n.

Watson, ELKANAH, 1758–1842. American traveler and promoter of public works. *Tour in Holland,* 1790; *Hist. Canals in N. Y.,* 1820; *Agricultural Societies,* 1820.—His son, WINSLOW COSSOUL, b.1803, ed. his *Memoirs,* 1855, and pub. *Hist. Essex Co., N. Y.,* 1870.

Watson, GEORGE LENOX, b.1851 in Glasgow. Designer of yachts.

Watson, HENRY CLAY, 1831–1869. American journalist. *Camp-fires of the Revolution,* 1851.

Watson, HENRY COOD, 1816–1875. Anglo-American journalist; founder *Art Journal* 1862; musical critic.

Watson, HEWETT COTTRELL, 1804–1881. English botanist. *Distribution of British Plants,* 1832; *Cybele Britannica,* 4 vols., 1847–59.

Watson, JAMES CRAIG, LL.D., 1838–1880. Prof. Univ. Mich. 1859; Director Observatory there 1863, and of Washburn Observatory, Univ. Wis., 1879; discoverer of 22 asteroids. He left with the Academy of Sciences a fund for computing and publishing tables of their motions. He had charge of an expedition to Peking 1874 to observe the transit of Venus. *Comets,* 1860; *Theoretical Astronomy,* 1868.

Watson, JOHN ("IAN MACLAREN"), b.1840. Presb. minister at Liverpool. His novel, *Beside the Bonnie Brier Bush,* 1894, was highly successful. *Days of Auld Lang Syne,* 1895; *Mind of the Master,* 1896.

Watson, JOHN, LL.D., b.1847 in Glasgow. Prof. Queen's Univ., Kingston, Canada, 1872. *Kant,* 1881–88; *Schelling,* 1882; *Comte, Mill, and Spencer,* 1895.

Watson, JOHN WHITTAKER, 1824–1890. American poet. *Beautiful Snow,* 1869.

Watson, MUSGRAVE LEWTHWAITE, 1804–1847. English sculptor.

Watson, PAUL BARRON, b.1861. Boston lawyer. *Life of Marcus Aurelius,* 1884.

Watson, RICHARD, D.D., 1737–1816. Bp. of Llandaff 1782. His *Apology for Christianity,* 1776, and *for the Bible,* 1796, answering Gibbon and Paine, and *Theological Tracts,* 6 vols., 1785, were much valued.

Watson, RICHARD, 1781–1833. English Wesleyan. His *Theological Institutes,* 1823–24, "has been the standard of Methodism." His *Life of John Wesley,* 1831, *Biblical and Theological Dictionary,* 1832, *Sermons,* 1834, and other works, have been much used.

Watson, SERENO, M.D., 1826–1892. Curator Gray Herbarium at Harvard 1888. *Botany of U. S. Geological Exploration of 40th Parallel,* 1871.

Watson, THOMAS, ab.1557–1592. English poet, one of the "Amorettists."

Watson, WILLIAM, b.1834. Prof. Mass. Inst. of Technology 1865–73. *Descriptive Geometry,* 1873; *Shades and Shadows,* 1885.

Watson, WILLIAM, b.1855. English poet. *Lachrymæ Musarum,* 1892; *Excursions in Criticism,* 1893; *Father of the Forest,* 1896.

Watt, or VOLT-AMPÈRE. Energy of an electric current of one ampère strength under an electromotive force of one volt; equal to 10^7 ergs per second. 746 watts are equal to one horse-power nearly. A watt-hour is the total amount of energy expended in one hour where the rate of working has been one watt. It is equal to 36×10^9 ergs.

Watt, JAMES, 1736–1819. Scottish civil and mechanical engineer. He designed bridges, greatly improved the steam engine, made the first rotary steam motor, and invented the engine governor. He was an instrument maker of

Glasgow 1754; began the study of steam 1758; built model engines 1761–68, and with Matthew Boulton operated the

James Watt.

Soho works near Birmingham 1773–1800. See ENGINE and HISTORY OF STEAM.

Watt, ROBERT, 1774–1819. Physician at Paisley and Glasgow; medical writer. *Bibliotheca Britannica*, 4 vols., 1824.

Watteau, ANTOINE, 1684–1721. French painter of court life and amusements; leading artist of his time in France; good colorist and sagacious observer.

Watteau, BOUDOIN LOUIS, 1570–1627. French traveler. *Voyage*, 1627.

Watterson, HENRY, b.1840. Ed. Louisville *Courier-Journal* since 1868; M.C. from Ky. 1876–77; Democratic leader.

Watt-Hour. See WATT.

Wattignies. In n. France; scene of a defeat of Austrians by French under Jourdan, Oct. 16, 1793.

Wattles. Several species of Australian *Acacias*, trees of the natural family *Leguminosæ*, prized for their hard wood and for the bark, which is used in tanning.

Wattmeter. Instrument for measuring the power expended in electric circuits.

Watts, ALARIC ALEXANDER, 1797–1864. English poet, pensioned 1854; ed. *Literary Souvenir* 1824–37, and *United Service Gazette* 1833–43.

Watts, FREDERICK, 1719–1795. Revolutionary officer; Brig.-gen. Pa. troops 1782.—His grandson, FREDERICK, 1801–1890, was presiding judge 9th Pa. district 1849–52, and Commissioner of Agriculture 1871–77. *Reports Pa. Supreme Court*, 19 vols., 1833–46.—His brother, HENRY MILLER, b.1805, was U. S. Minister to Austria 1868–69.

Watts, GEORGE FREDERICK, D.C.L., b.1817. Most thoughtful and imaginative of recent English painters; chiefly of portraits and allegories, the latter of profound meaning and literary purpose. His execution is wholly a means to the expression of thought. An exhibition of his works was held at the New York Metropolitan Museum 1884. *Love and Death* and *Love and Life* were seen at the World's Columbian Exposition.

Watts, HENRY, F.R.S., 1815–1884. English chemist. *Dict. Chemistry*, 5 vols., 1863–68; supp. 1872, 1875, 1881; new ed. by Morley and Muir, 4 vols., 1889–94.

Watts, ISAAC, D.D., 1674–1748. Father of English hymnody. His *Hymns and Spiritual Songs*, 1707, and *Psalms of David*, 1719, had a mighty influence: a large proportion of them was in general use for over a century. *Divine and Moral Songs for Children*, 1720, were long popular. *Horæ Lyricæ*, 1706, is of less importance. His *Logic*, 1725, and other treatises, were formerly valued.

Watts, ROBERT, D D., b.1820 in Ireland. Presb. pastor in Phila. 1852–63, and Dublin 1863; prof. Belfast since 1866; prolific writer on theology and philosophy.

Watts, THOMAS HILL, 1819–1892. Confederate Atty.-gen. 1862; Gov. of Ala. 1863–65.

Watts, WALTER THEODORE, b.1836. English poet and critic.

Wat Tyler. See TYLER, WAT.

Waugh, EDWIN, 1817–1890. Lancashire poet and descriptive writer, mostly in dialect; pensioned 1882. *Works*, 11 vols., 1881–83.

Waurin, JEHAN DE, 15th cent. French-English chronicler. His work, extending to 1471, was pub. in 5 vols. 1864–91, and partly tr. 1864–87.

Wausau. Capital of Marathon co., Wis., on Wisconsin River; settled 1842. It has some manufactures and a large trade in lumber. Pop., 1895, 11,013.

Wauters, ÉMILE, b.1846. Belgian historical painter.

Wave-Force. Dynamic pressure produced by a wave of the Atlantic Ocean impinging upon a surface has been observed to be as great as 6,100 lbs. per sq. ft.

Wave-Length. In any wave motion, distance from a vibratory particle to the next one in the same phase.

Wavellite. $3Al_2O_3,2P_2O_5,12H_2O$. Natural hydrous aluminium phosphate, occurring in small radiated or globular masses. Magnet Cave, Ark., is one of its localities.

Wave-Motion. Act of propagating through an elastic medium an undulation or wave. A wave may be defined as the continued transmission of a relative state of particles by the successive reciprocating vibrations of the individual particles. Waves of the Atlantic attain a length of 600 ft. and a height of 48 ft. Such a wave was 11 sec. in passing a given point.

Wave of Cold. Sudden change in temperature, now known as Cold Wave.

Waverley Novels. See SCOTT, WALTER.

Waves. See RADIATION, REFLECTION, REFRACTION, SOUND, WAVE LENGTH, and WAVE MOTION.

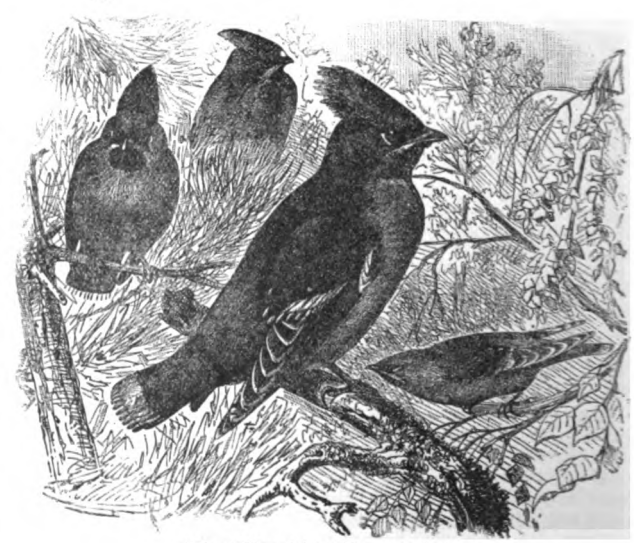
Wax. Substance both of animal and vegetable origin. See BEESWAX, MINERAL WAX, OZOKERITE, and SPERMACETI.

Wax-Bill. Small seed-eating bird of many species, inhabiting the Oriental region, and having short thick bills resembling sealing-wax in colors and gloss. Some are pleasant singers and are kept as cage-birds; *e.g.*, the Java Sparrow.

Wax-Myrtle. See BAYBERRY.

Wax-Palm. *Copernicia cerifera*. Palm, native of Brazil, its young stems and leaves secreting a large amount of wax, which is collected and exported. *Ceroxylon andicola* of Columbia, also a palm, yields a similar secretion.

Wax-Wing. Bird with soft plumage, and erectile crest; the tips of the secondary wing feathers (and in some species the tail also) bear appendages resembling red or yellow sealing wax. *Ampelis cedrorum* is the common cedar bird of the U. S.



Wax-Wing (*Ampelis garrulus*).

A. garrulus is the Bohemian or Northern Wax-wing of Europe, Asia, and America. It goes in flocks, visiting different countries in successive years: its appearance was once believed to herald disaster.

Waxwork, IN BOTANY. See BITTERSWEET.

Wax Works. The ancient Egyptians used wax figures of their deities in funeral rites, and deposited them in their graves; many of these are now preserved in museums. The Greeks made wax dolls. In the beginning of the 18th century wax anatomical specimens were first shown. The most famous modern wax-work exhibition is in London, owned by Madame Tussaud, and consists of models of noted persons. This collection originated in Paris during the Revolution. Beeswax is the most convenient medium, as it is fluid at a low heat, can be easily cut and shaped, takes surface tints well, and easily mixes with any coloring matter.

Waxy Degeneration. Degenerative change of a tissue, occurring during the progress of some disease, which causes the affected part to have a waxy appearance upon section. It is due to the infiltration of lardacein, which is stained a deep, mahogany brown upon the application of iodine. The spleen, liver and kidneys are most frequently attacked, and the concurrent disease is such as to cause a drain on the system; chronic bone disease, pulmonary tuberculosis, etc. A removal of the cause may arrest the progress of the degeneration. It is also known as albuminoid disease.

Way. Right of private passage by a defined course over another's land, arising either by grant, by prescription, or from necessity.

Way, ANDREW JOHN HENRY. 1826–1888. American painter.

Way, COVERED. See COVERED WAY.

Wayfaring Tree, AMERICAN. See HOBBLE-BUSH.

Wayland, THE SMITH. Mythical hero of old German, Norse, and Anglo-Saxon poems.

Wayland, FRANCIS, D.D., LL.D., 1796–1865. Pres. Brown Univ. 1827–55; eminent as a preacher. His *Moral Science*, 1835, *Political Economy*, 1837, and *Intellectual Philosophy*, 1854, were long used as text-books.—His son and biographer (with his brother FRANCIS, LL.D., b.1826), HEMAN LINCOLN, D.D., b.1830, ed. *National Baptist* 1872–94.

Wayne, ANTHONY, 1745–1796. Col. 4th Pa. 1776; Brig.-gen. Feb. 1777; prominent at Brandywine, Germantown, Monmouth, and in the capture of Stony Point, as later in Va. and Ga. As Gen.-in-chief of the U. S. Army 1792 he defeated the Indians on the Maumee, Aug. 20, 1794, and negotiated with them an important treaty 1795.

Wayne, JAMES MOORE, LL.D., 1790–1867. Judge of Ga. Superior Court 1824–29; M.C. 1829–35; Justice U. S. Supreme Court from 1835.

Waynesborough. Village of Augusta co., Va.; scene of Early's defeat by Sheridan March 2, 1865.

Waynfleet, WILLIAM OF, ab.1405–1486. Bp. of Winchester 1447; Chancellor 1456–60; founder of Magdalen Coll., Oxford, 1448–56.

Wazan. Town of Morocco, 90 m. s.e. of Tangier; home of the Grand Shereef and resort of pilgrims; founded ab.880. Pop. 20,000.

Weak-Fish, or SQUETEAGUE (CYNOSCION). Fish living near estuaries on the U. S. coast s. from N. J. It attains a weight of 1 to 10 lbs., and larger in the South. It is migratory, spending the summer North, and is most abundant when its enemy the Bluefish is least prevalent. It snaps at bait readily, and must be carefully hauled in because of its weak mouth. It has irregular dark spots, those on the back being round in a related Southern species known as Sea-trout. See ACANTHOPTERI.

Weald. Fresh-water formation in s.e. England, at the base of the Cretaceous series, with which it has been generally connected. Recent evidence derived from its vertebrate fossils has led many geologists to believe that it is more closely allied to the underlying Jurassic system.

Wealth. So much of one's possessions as can be transferred or exchanged.

Weaning. Process of substituting substantial food from external sources for the milk used in early infancy. It is a period for special care-taking both for mother and child. The precise time of weaning must be determined by the circumstances of each case. As there is a period of rest in teething after the appearance of the 8 incisor teeth, 10 months is ordinarily named as the proper time.

Weare, MESHECH, 1713–1786. Pres. of N. H. 1776–85; Chief-justice 1777.

Weasel. Member of the genus *Putorius*, family *Mustelidæ*, including small carnivores with very slender body. *P. vulgaris* is the common Weasel. It lives in the colder parts of the n. hemisphere, attains a length of 8 in., with the tail 2¼ in. It is reddish-brown above and white below, the end of the tail never becoming black. In extremely cold seasons the fur becomes all white except the end of the tail. It lives on small birds

Weasel (*Putorius vulgaris*).

and rodents; the latter it readily follows in their retreats, owing to its slenderness, small head, long neck, and short limbs. Two or three litters per year of ab. five young each are brought forth in burrows, and are courageously defended by the mother.

Weatherboards. Outer boards of a wooden house.

Weather Bureau. Established in 1891 as a branch of the U. S. Department of Agriculture, to continue the meteorological work of Signal Service, instituted 1870. See AGRICULTURE, DEPARTMENT OF, and WEATHER SERVICE.

Weathercock. Use of a cock as a vane is said to date from the 9th century, when a certain pope ordered it placed on all church steeples as an emblem of St. Peter, who denied the Lord before the cock crew twice. See VANE.

Weather Cycle. Periodic recurrence of any feature of the weather. Such cycles have been sought for in vain for many ages. The ancients were guided in their search by the planetary configurations, and the modern astrologists have followed their lead. Since the days of Galileo the accumulation of meteorological records has led to the discovery of many local cycles of empyrical lengths, and since the publication of Wolf's sunset numbers there have been extensive studies in sunset cycles and a cycle of 26 days, coinciding with the rotation of the sun on its axis. The law of hydronamics shows that atmospheric motions are compounded of many minor cycles.

Weather-Gage. Position of a fleet or ship when to windward of another.

Weather-Gaw. Any sign of approaching change in the weather.

Weather Glass. Apparatus that indicates the condition of the present or future weather; especially in four forms. 1. Crude Galileo air thermometer ab.1630. 2. Since ab.1660, any form of barometer. 3. Camphor barometer. 4. Most frequently, hygroscopic apparatus showing the effects of moist and dry weather.

Weather House. Hygroscope, so constructed of two figures connected by a piece of hygroscopic substance, as wood, that one or other retires into a little house as the moisture of the air increases or decreases.

Weather Plant. In Corsica and Tunis, species of plant the condition of whose leaves is said to indicate the approaching weather 48 hours in advance.

Weather Quarter. On windward side of a ship.

Weather Rules. Any system for foretelling the weather; *e.g.*, Halley's rules, 1700, for barometer; Harris rules, 1730, for barometer and hygrometer; Herschel's rules, so called, but really not his.

Weather Service. Any official government organization for observing and utilizing meteoric data: weather bureau, as at Washington; meteorologic office, as at London; meteorologic institute, as those of Germany, Austria, and Russia.

Weather Side. That on which the wind blows.

Weather Signal. Any signal displayed to announce approaching weather; those ordered daily by telegrams from the Signal Office at Washington to be displayed in early morning

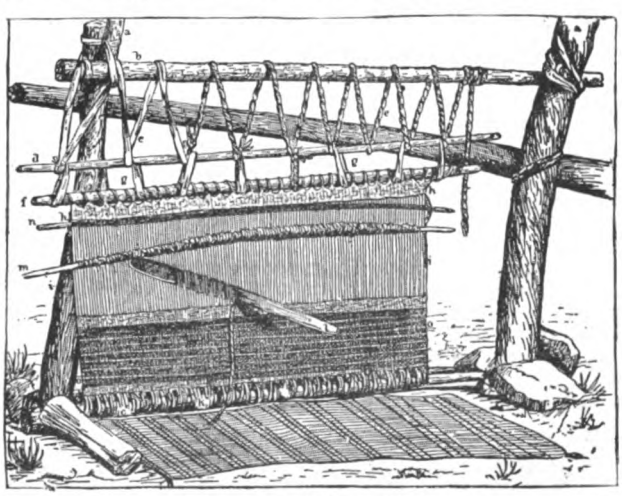
at towns or on railroad trains throughout the country, to announce the weather for 24 hours from the time of display, and, by reading from the top signal downward, to predict fair or rain, warmer or colder. White square flag indicates fair weather; blue square flag indicates rain or snow; black triangular flag, when placed above the two previously mentioned, indicates warmer weather, when placed below them, colder weather; white square flag with black square in center indicates fall in temperature or cold wave. The square flags are 6 ft. square, the triangular flag is 6 ft. long by 4 ft. wide.

Weather Types. Conditions of the weather or weather chart that are typical of succeeding well-recognized changes. Four such types were specifically described by Abercromby 1887 as defined by systems of isobars.

Weaver-Birds. Members of the family *Ploceidæ*, including over 250 species, chiefly African. They resemble Sparrows, but the male is brightly colored, and some undergo great change of plumage during the breeding season. The bills are grosbeak-like, but there are 10 primaries. They all build closely woven nests of remarkable shapes. The Philippine bird makes a rope suspended from the end of a limb over water; near its lower end is an enlargement, the nest, entered by means of the tubular extension below. The Social Weavers construct mushroom-like domes of grass upon the stems of trees, and 20 to 40 nests are made under each roof; as many as 300 have been found united into one aggregation of united roofs, resembling the huts of the natives. Members of the genus *Estrelda* are kept as cage-birds, and are pleasant songsters.

Baya Weaver-bird and Nest (*Ploceus baya*).

Weaving. Process of converting fibers into fabrics, performed upon a frame called a LOOM (q.v.). It is not known who were the first to practice it, or what fabric was first produced. The Chinese claim to have practiced silk weaving 2500 B.C. The Egyptians ascribed the art to Isis; the Greeks to Minerva; and the Peruvians to the wife of Manco Capac. The holy coat of Treves was woven in one whole piece. The essential operations in weaving are the successive raising of certain threads of the warp, and the depression of others, so as to form a passage for the weft yarn, which is then beaten up by means of a batten.



Ordinary Navajo blanket loom.

Web. Plate that joins the upper and lower flanges of a beam; or members joining the upper and lower chords of a truss.

Webb, CHARLES HENRY ("JOHN PAUL"), b.1834. American author and inventor. *Parodies*, 1876; *Vagrom Verse*, 1889. Several of his books are burlesques of well-known novels or plays.

Webb, GEORGE JAMES, 1803–1887. Anglo-American organist, teacher, and compiler of tune-books.

Webb, CAPT. M., d.1895. English champion swimmer. See SWIMMING.

Webb, SAMUEL BLATCHLEY, 1753–1807. Officer of Conn. troops 1775; aid to Washington 1776; prisoner 1777–80.—His son, JAMES WATSON, 1802–1884, was editor New York *Courier and Enquirer* 1829–61, and Minister to Brazil 1861–69. *Altowan*, 1846; *Slavery*, 1856.—His son, ALEXANDER STEWART, U.S.A., LL.D., b.1835, Brig.-gen. U. S. Vols. 1863–66, was distinguished at Gettysburg and in Va., and became pres. Coll. New York 1869. *The Peninsula*, 1882.

Webb, SIDNEY, b.1859. English economist. *Socialism*, 1889.

Webb, THOMAS, 1724–1796. English officer, pioneer of Methodism in America 1767–72.

Webb, THOMAS SMITH, 1771–1819. American founder of Masonic chapters and encampments. *Freemason's Monitor*, 1797.

Webbe, WILLIAM. English playwright and critic. *Discourse of Poetrie*, 1586.

Webber, CHARLES WILKINS, 1819–1856. American novelist, traveler, and adventurer, killed in Nicaragua under Walker. *Old Hicks the Guide*, 1848; *Hunter-Naturalist*, 1851.

Webber, SAMUEL, D.D., 1759–1810. Prof. Harvard 1789, pres. 1804. His *Mathematics*, 1801, was long in use.

Weber. Unit magnetic pole, being one that will repel an equal pole at a centimeter distance with a force of one dyne; name proposed by Clausius and Siemens.

Weber, ERNST HEINRICH, 1795–1878. Prof. Leipzig from 1818; writer on anatomy and physiology.—His brother WILHELM EDUARD, 1804–1891, Prof. of Physics at Göttingen 1831–37 and 1849, and Leipzig 1843–49, wrote on magnetism and electricity.

Weber, FRIEDRICH, 1781–1823. Prof. of Botany at Kiel. *Beiträge zur Naturkunde*, with D. M. Mohr, 1805–10, *Botanisches Taschenbuch*, 1807; *Historiæ muscorum hepaticorum prodromus*, 1815.

Weber, FRIEDRICH ALBRECHT, b.1825. Prof. Berlin from 1856; Sanskrit scholar. *Indische Studien*, 17 vols., 1849–89.

Weber, GEORG, 1808–1888. Teacher at Heidelberg. His *Outlines of Universal History*, tr. 1852, was widely used. *Weltgeschichte*, 15 vols., 1857–80.

Weber, KARL MARIA VON, 1786–1826. German opera composer of the romantic school, and one of the most influential musicians of the century. He opened a new world to German opera with his *Freischütz* 1821, and as composer and conductor at Dresden from 1816 exerted a powerful influence on Wagner. He produced *Oberon*, written to English words, in London 1826. Other operas are *Abu Hassan*, 1811, *Silvana*, 1812, *Euryanthe*, 1823. He composed voluminously in other forms, especially for pianoforte.

Weber, MAX, b.1824 in Baden. Brig.-gen. U. S. Vols. 1862–65, serving in Va.; Collector of internal revenue in New York 1872–83.

Weber, PAUL, b. ab.1823. German landscape painter, in Phila. 1848–58.

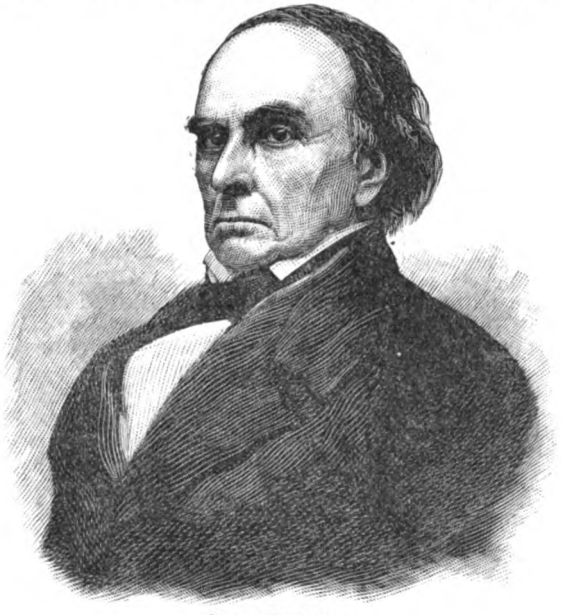
Weber River. In n. Utah, flowing ab. 170 m. w. and n.w. to Salt Lake.

Weber's Law. See PSYCHOPHYSICS and FECHNER'S LAW.

Webster, AUGUSTA (DAVIES), 1840–1894, m.1863. English poet, novelist, and dramatist.

Webster, DANIEL, 1782–1852. Greatest of American orators, and eminent as statesman and constitutional lawyer; M.C. from N. H. 1813–17, and from Mass. 1823–27; moved to Boston in 1816; U. S. Senator 1827–41 and 1845–50; Sec. of State 1841–43 and 1850–52. Probably the most famous of his many memorable speeches were that on the Dartmouth College case, 1818, and his defense of the Union in reply to Hayne of S. C., 1830. He won great favor in the North by his advocacy of tariffs, and lost much of it in later life by defending the slave system. In 1842 he negotiated the Ashburton treaty with Britain. For 20 years he shared with Clay the leader-

ship of the Whigs, and was the most conspicuous of public men; but his ambition was never gratified by a Presiden-



Daniel Webster.

tial nomination. *Speeches*, etc., 6 vols., 1851. *Correspondence*, 1857.

Webster, JOHN. English dramatist of remarkable power. His greatest tragedies are *The White Devil*, 1612, and *The Duchess of Malfi*, 1623.

Webster, JOHN ADAMS, U.S.N., 1785–1876. Defender of Baltimore 1812.

Webster, JOHN WHITE, M.D., 1793–1850. Prof. Harvard 1827–50; hanged for the murder of Dr. G. Parkman.

Webster, JOSEPH DANA, 1811–1876. Brig.-gen. U. S. Vols. 1862–65; chief of staff to Grant and Sherman; collector at Chicago 1872.

Webster, JOSEPH PHILBRICK, 1820–1875. American composer, chiefly of songs.

Webster, NOAH, 1758–1843. American teacher, whose spelling-book, included in *A Grammatical Institute*, 1783–85, was enormously successful. He labored hard for copyright, and pub. sundry treatises and a *Grammar*, 1807. His celebrated *American Dictionary*, the foundation of that now in use under his name, appeared 1828.

Webster, PELATIAH, 1725–1795. Phila. patriot and publicist. *Political Essays*, 1791.

Webster, SIR RICHARD EVERARD, b.1842. Queen's counsel 1878; M.P. 1885; Atty.-gen. 1885–92 and 1895.

Webster, WARREN, M.D., b.1835. Surgeon U.S.A. since 1860. *Army Medical Staff*, 1865.

Wecker, LOUIS DE, b.1832 in Germany. French writer on diseases of the eye.

Wedderburn, ALEXANDER, 1733–1805. M.P. 1762; Solicitor-gen. 1771; supporter of tyranny in America; Atty.-gen. 1778; Baron Loughborough and Chief-justice 1780; Lord Chancellor 1793–1801; Earl of Rosslyn 1801.

Wedderburn, JAMES, ab.1500–ab.1564. Scottish playwright and satirist.—His brothers, JOHN, d.1556, and ROBERT, wrote most of *The Gude and Godlie Ballates*, used by early Scottish reformers.

Wedding Customs. Many different rites of marriage are practiced, which no doubt arose by degrees and in many different ways, and which at a later day survived as a ceremony. The Malay custom of the man and woman eating out of the same dish is one of the oldest. The Romans offered a cake of spelt to Jupiter in the presence of witnesses. Wives were often bought or captured; in the latter case the bridegroom had a helper, who at the present day is known as best-man. The wedding day was also of importance, the Bedouins preferring Friday, and the Chinese the last month in the year. See HANDFASTING, MARRIAGE, and PENNY WEDDINGS.

Wedge. Simple machine, usually consisting of an isosceles prism of wood or metal having one very acute dihedral angle called the edge. The face opposite the edge is called the back. It is used frequently for splitting blocks of stone or wood.

Wedge. Solid bounded by five plane figures, a parallelogram (the back), two trapezoids (the faces), and two triangles (the ends). See UNGULA, SPHERICAL.

Wedgwood, JOSIAH, F.R.S., 1730–1793. English improver of pottery, founder of British ceramic art; grandfather of Darwin. Much of his ware was from designs by Flaxman. He is

Wedgwood Cup and Saucer (blue and white).

chiefly celebrated for his decorations, vases, etc., in imitation of the antique, which are still highly valued. He accumulated a large fortune, which he dispensed with princely benevolence and great public spirit.

Wednesbury. Town of Staffordshire, 8 m. n.w. of Birmingham; noted for its iron manufactures. Pop., 1891, 25,342; Parliamentary borough, 69,083.

Wednesday. Fourth day of the week; so called from Odin or Woden, the Scandinavian god of war.

***Weed.** Plant out of place, intruder in gardens and fields, or inhabiting waste places and retreating before cultivation.

Weed, STEPHEN HINSDALE, U.S.A., 1834–1863. Captain of Artillery 1861; Brig.-gen. U.S.Vols. 1863; killed at Gettysburg.

Weed, THURLOW, 1797–1882. Founder Albany *Evening Journal*, 1830, which he controlled till 1863; Whig and Republican leader, long powerful in N. Y. politics. *Letters*, 1866; *Autobiography*, 1882.

Weeden, WILLIAM BABCOCK, b.1834. American writer on labor. *Economic Hist. New England*, 1890.

Weedon, GEORGE, ab.1730–ab.1795. Va. officer, Brig.-gen. 1777 and 1780.

Week. Period of seven days; supposed to be first used among the Jews, who observed the Sabbath every seventh day. They had three sorts of weeks; the common one of 7 days, the second of 7 years, and the third of 7 times 7 years, at the end of which was the jubilee.

Weekes, HENRY, 1807–1877. English sculptor, R. A. 1863.

Weeks, EDWIN LORD, b.1849 in Boston. Painter, chiefly of Oriental scenes; resident in Paris.

Weeks, FEAST OF. Name originally given to PENTECOST (q.v.).

Weems, MASON LOCKE, ab.1760–1825. Erratic Va. minister, book-agent, and pamphleteer; biographer of Washington, 1800, and others; author of the cherry-tree and hatchet legend.

Weenix, JAN BAPTISTA, 1621–1660. Dutch landscape, genre and animal painter.—His son, JAN, 1640–1719, followed the same profession with great success.

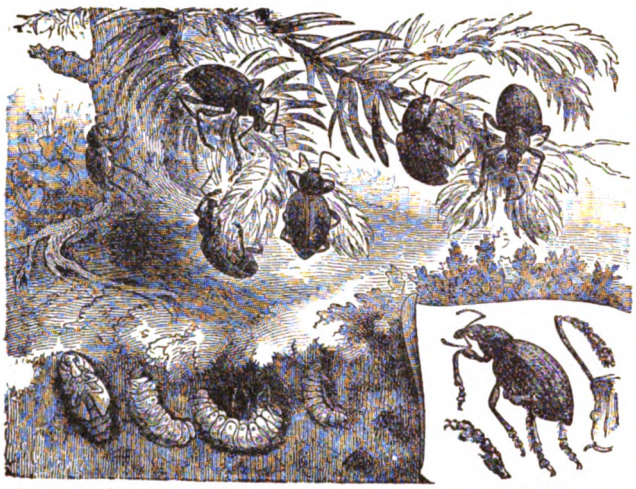
Weep Hole. Hole through a retaining wall to let out water that accumulates behind it.

Weeping. In Botany, having slender, flexible branches which hang downward.

Weeping. When the lachrymal glands are stimulated to such a degree that the secretion cannot be carried off through the usual channels, the excess of secretion is known as tears, and the process weeping. It may be produced by an irritation of the eye or, reflexly, by a distant irritation, as of the mucous membrane of the nose; or by a strong emotion, more especially grief. See TEARS.

Weever, JOHN, 1576–1632. English antiquarian. *Funeral Monuments*, 1631.

Weevils. Family *Curculionidæ*, including over 10,000 species of beetles. They all have a long straight rostrum in front of the head; from its sides, apparently, spring the antennæ, which really are inserted further back. The rostrum is used



Large Black-Nut Beetle (*Otiorhynchus niger*), with Larvæ and Cocoon.

for boring into nuts, seeds and bark while the shoots are young, so that the eggs may be lodged within and the young on hatching will find food. The result is gradual death of the part affected and premature dropping of the fruit. See TETRAMERA.

Wegscheider, JULIUS AUGUST LUDWIG, 1771–1849. Prof. Halle 1810. His *Institutiones theol. dogmaticæ*, 1815, were in the rationalist interest and had considerable influence.

Wehrlite. Mineral found in Hungary, consisting essentially of bismuth and tellurium and sometimes containing silver. It is closely allied to TETRADYMITE (q.v.).

Weidner, REVERE FRANKLIN, D.D., b.1851. Prof. Augustana Sem. 1882–91; theological writer.

Weigel, VALENTIN, 1533–1588. German mystic, of posthumous fame as a pantheist. A sect was founded on his doctrines.

Weighing-Machine. See BALANCE, HYDROMETRY, HYDROSTATIC BALANCE, JOLLY BALANCE, SCALES, and TORSION BALANCE.

Weight. Force exerted by the earth upon all bodies, tending to draw them to itself; hence that of any body is measured by the mutual attraction between it and the earth. Weight is proportional to mass, and inversely proportional to the square of the distance of the body from the center of the earth, if the former be above the surface, but directly proportional to that distance if it be below the surface. The common units of weight are the pound and grain. See UNITS.

Weight. In Determinants, sum of the suffixes in the several terms.

Weight, DIFFERENCE OF, BETWEEN EQUATOR AND POLE. At either pole of the earth a body weighs $\frac{1}{190}$ of the whole amount more than at the equator. This difference is due to the oblate form of the earth and to the centrifugal force of its rotation.

Weights, ATOMIC. See ATOMIC WEIGHTS.

Weights and Measures. Weights are used to determine the gravity of bodies and measures to determine the magnitude of bodies or the space which they occupy. These are attributed to Pheidon, tyrant of Argos, 895 B.C. Weights were originally taken from grains of wheat, the lowest being still called a grain. See METRIC SYSTEM, UNITS; and WEIGHTS AND MEASURES in Addenda.

Weihaiwei. On coast of China; taken by Japanese Jan. 30, 1895; ceded to Gt. Britain by China 1898.

Weil, GUSTAV, 1808–1889. Prof. Heidelberg 1861; historian of the Caliphs and the Moslem nations. *Life of Mohammed*, 1843.

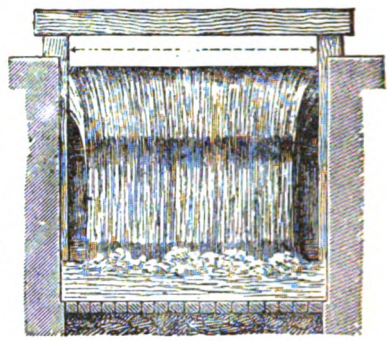
Weil, HENRI, b.1818. Prof. Paris 1876; editor of Æschylus and other Greek classics.

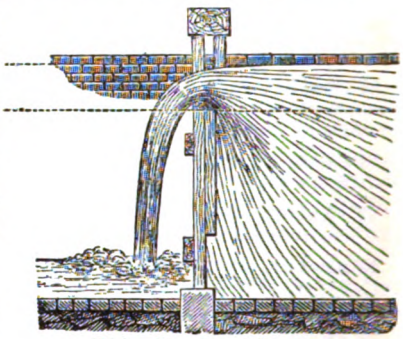
Weilen, JOSEPH VON, 1828–1889. Austrian poet and dramatist.

Weimar. Capital of Saxe-Weimar; on the Ilm; residence of Goethe and Schiller; noted for literary associations. Pop., 1890, 24,546.

Weimar, DUKE OF. See BERNHARD.

Weir. Crest of a dam over which water flows; vertical notch in the side of a reservoir, so arranged that the head of water above its lower edge can be measured, and thus the discharge be computed. This is one of the most precise methods of measuring the flow of a small stream. See SUBMERGED WEIR.





Weir with a Level Crest.

Weir, HARRISON WILLIAM, b.1824. English painter and engraver, especially of animals.

Weir, ROBERT WALTER, 1803–1889. N.A. 1829; Prof. of Drawing at West Point 1832–74; historical painter.—His sons are also artists: JOHN FERGUSON, b.1841, N.A. 1866, became director of Yale School of Fine Arts 1869; JULIAN ALDEN, b. 1852, N.A. 1886, is a painter of serious purpose and marked talent in New York.

Weise, CHRISTIAN, 1642–1708. German novelist and dramatist.

Weishaupt, ADAM, 1747–1830. Prof. of Canon Law at Ingolstadt, Bavaria; founder of the ILLUMINATI (q.v.) 1776; degraded and banished 1785.

Weismann, AUGUST, b.1834. Prof. Freiburg 1873; very eminent biologist. *Theory of Descent*, tr. 1882; *Heredity*, tr. 1889–92; *Germ-plasm*, tr. 1893.

Weismann's Theory of Heredity. Most important features of this are: (*a*) Doctrine of the continuity of germ plasm; *i.e.*, that the eggs and sperm cells of any organism are direct descendants of the germ cells of the parent, without any intervening generations of somatic cells. The latter are in a sense distant cousins of the reproductive cells, both kinds having a common ancestor in the egg-cell from which the organism was developed. (*b*) Denial of the transmissibility of acquired characters; *i.e.*, that new characteristics appearing solely in the organs or tissues of the body, as a result of the action of the environment or otherwise, cannot be transmitted to the offspring. W. does not believe, as does Darwin (see PANGENESIS), that the tissue cells give off gemmules, bearing their respective characteristics, to be stored up in the germ-cells for the purpose of rendering the latter capable of developing into a new and complete body; he rejects BROOKS' THEORY OF HEREDITY (q.v.), and is radically opposed to the NEO-LAMARCKIANS (q.v.). (*c*) The different organs, etc., of the body are represented in the egg-plasm (by gemmules or otherwise) correspondingly differentiated; and development consists in the successive analysis or separation of the different sorts by means of egg-cleavage or cell-division, while the various kinds of plasma appropriate to different parts of the body maintain their local relations throughout development. *E.g.*, to suggest the general method, let us assume that the first cleavage of the egg results in the ancestral cells of the reproductive tissues and of the soma respectively. The cleavage of the soma-cell results in the cells from which ectoderm and mesentoderm respectively develop. Division of the latter defines the mesoderm and entoderm, and in turn the mesoderm separates into muscle cells and connective tissue cells. Finally, when the analysis has been completed, the cell multiplication results in increase of similar plasma for each tissue, until the body acquires its proper size. (*d*) An explanation of the signifi-

cance of the polar globules; viz., the first polar cell represents extruded histogenic plasma, *i.e.*, plasma which has the office simply of developing the eggs as members of a tissue and furnishing them with yolk. When this plasma has been extruded, the egg is an independent being capable of development, and in a proper environment it does so develop. If the second polar cell is extruded, the egg has lost its power to develop, unless, by fertilization or conjugation with a sperm, the power is restored. W. has shown that parthenogenetic ova produce but one polar cell during maturation. In all cases of development following fertilization, the polar-cell cleavage of the egg nucleus is repeated twice, so that the sperm conjugates with one-fourth of the original nucleus. (*e*) Explanation of the phenomena of conjugation among the *Protozoa*. In some *Ciliata* there is mutual copulation, the nucleus of each cell individual dividing twice: one of the products then becomes a conjugation nucleus, which is transferred to the other cell (mutually) and there unites with one of the nuclei (the other two disappearing) to form the segmentation nucleus. W. believes this procedure to be essentially universal in the conjugation of the one-celled animals: so we see that the *Metazoa* differ from the *Protozoa* only in two particulars; (1) the products of segmentation remain united to form a body in the former group, while they live separate lives in the latter group; (2) the union of the cells has favored tissue-differentiation, so important among the *Metazoa*. (*f*) Explanation of the fact that sexually produced organisms are much more variable than those asexually produced. Among unicellular organisms, acquired characters are transmitted to the offspring, because the latter are a part of the parent. When plasmas with slightly different characters, though belonging to the same species, are united by conjugation, a new combination or resultant cross breed is obtained, and this will necessarily be different for every case of conjugation. The application is readily made to the sexual reproduction of the *Metazoa*. The variations that the plasm of the germ cells have undergone are transmitted both to the somatic cell descendants and to the reproductive cells of the next generation. Acquired characteristics of this sort are conserved, and thus Natural Selection has material to work on in evolving new species. There still remains a question to be answered; viz., Are the variations of the germ plasm fortuitous, or are they governed by definite laws? If the latter, what are the laws? Here biology seeks light.

Weiss, BERNHARD, b.1827. Prof. Kiel 1863, and Berlin 1877. *Biblical Theology of N. T.*, 1868, tr. 1882–83; *Life of Jesus*, 1882, tr. 1883–84; *Introduction to N. T.*, 1886, tr. 1889.

Weiss, CHRISTIAN SAMUEL, 1780–1856. Prof. Berlin; mineralogist, especially eminent as a crystallographer.

Weiss, JOHN, 1818–1879. Biographer of Theodore Parker, 1864. *American Religion*, 1871.

Weisse, CHRISTIAN FELIX, 1726–1804. German dramatist.

Weisse, CHRISTIAN HERMANN, 1801–1866. Prof. Leipzig 1828–37; independent Hegelian. *Philosophie des Christenthums; Philos. Dogmatik*, 1855–62.

Weisse, JOHN ADAM, M.D., 1810–1888. French-American philologist. *English Language and Literature*, 1873; *Obelisk and Freemasonry*, 1881.

Weitbrecht, GOTTLOB FRIEDRICH, b.1840. Pastor at Stuttgart 1885. *Leben Jesu* (2d ed. 1883); *Unser Glaube*, 1888.

Weitzel, GODFREY, U.S.A., 1835–1884. Brig.-gen. U. S. Vols. 1862, Major-gen. 1863–66, serving chiefly in La. till 1864, and then in Va.; Major of Engineers 1866, Lieut.-col. 1882.

Weizsäcker, KARL HEINRICH, b.1822. Prof. Tubingen from 1861, succeeding Baur. *The Apostolic Age*, 1886, tr. 1894.—His brother, JULIUS, 1828–1889, prof. Tübingen 1867, Göttingen 1876, and Berlin 1881, ed. the *Deutsche Reichstagsakten*, vols. i. to vi., 1867–87.

Welbeck Abbey. Seat of the Duke of Portland, 3 m. s. of Worksop, Eng. It is in a park 10 m. in circumference and is mainly of the 17th century. It has a semi-underground picture gallery.

Welby, AMELIA B. (COPPUCK), 1819–1852, m. 1838. Ky. poet.

Welch, ADONIJAH STRONG, LL.D., 1821–1889 U. S. Senator from Fla. 1868–69; pres. Iowa Agricultural Coll. 1869–83. *Psychology*, 1888.

Welch, ASHBEL, 1809–1882. Engineer Delaware and Chesapeake Canal, and Camden and Amboy R.R.; introducer of the block system of signals.

Welch, PHILIP HENRY, 1849–1889. American humorist.

Welch, WILLIAM HENRY, M.D., b.1850. Prof. New York 1878 and Baltimore 1884; writer on pathology.

Welcker, FRIEDRICH GOTTLOB, 1784–1868. Prof. at Giessen 1803, Göttingen 1816, and Bonn 1819; editor of several Greek authors. He did much to develop classical archæology. *Kleine Schriften*, 5 vols., 1844–67.—His brother, KARL THEODOR, 1790–1869, prof. Bonn and Freiburg, wrote on economic and political topics.

Weld. *Reseda luteola.* Herb of the Mignonette family, native of Europe, formerly much cultivated as a dye-plant. It has been sparingly introduced into N. America. It contains luteoline, a yellow coloring matter, which is very durable and ranks next in vegetable dyes to the Persian berry. In later years it has been supplanted by quercitron to a great extent.

Weld (*Reseda luteola*).

Weld, HORATIO HASTINGS, D.D., 1811–1888. Rector in N. J.; author and compiler.

Weld, ISAAC, 1774–1856. Irish traveler in the U. S. and Canada 1795–97 His *Travels*, 1799, was widely read, and tr. into French and German.

Weld, THEODORE DWIGHT, 1803–1895. American writer against slavery. For his wife, ANGELINA EMILY, see GRIMKÉ.

Welde, THOMAS, ab.1590–1662. Minister at Roxbury, Mass., 1632; part author of Bay Psalm Book 1640; in England from 1646. *Antinomians*, 1644.

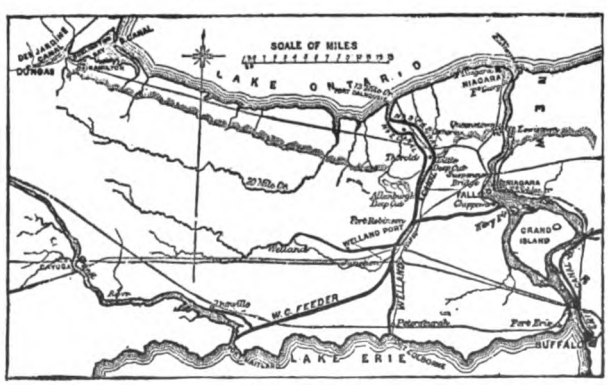
Welding. See FORGING OF METALS.

Weldon Railroad. In Va.; seized by the National troops Aug. 18, 1863, who lost 2,500 prisoners the next day. In another battle, Aug. 21, the Confederates lost 1,200.

Weldon's Process. In the preparation of chlorine, manganese dioxide is converted into manganese chloride, for which there is no market; by this process it is treated with calcium hydroxide, which converts it into manganese hydroxide. This is then mixed with more lime, and steam and air passed through the mixture, by which it is converted to calcium manganite. When this compound is treated with hydrochloric acid, chlorine is liberated and manganese chloride again formed. This is again treated with lime as before.

Welhaven, JOHAN SEBASTIAN, 1807–1873. Norwegian critical essayist and poet, prof. Christiania from 1846. *Norway's Twilight*, 1834.

Welland Canal. In Canada, between Lakes Erie and Ontario; begun 1833, enlarged 1871; length by the new and enlarged route, completed 1888, 26¾ m.; number of locks, 26;



Welland Canal.

total rise, 326¾ ft.; depth, 14 ft.; size of lock, 270 by 45 ft.; width of canal, 100 ft.; amount of tolls annually collected, ab. $250,000.

Well Drilling. See ARTESIAN WELL, DRILLING, OIL-WELL, and PETROLEUM.

Welle. River of central Africa, tributary to the Congo.

Weller, JOHN B., 1812–1875. M.C. from Ohio 1839–45; U. S.

Senator from Cal. 1852–57; Gov. of Cal. 1858–60; Minister to Mexico 1860–61.

Welles, GIDEON, 1802–1878. Comptroller of Conn. 1835 and 1842–43; Sec. U. S. Navy 1861–69.—His ancestor, THOMAS, 1598–1660, was Gov. of Conn. 1655–58.

Wellesley, ARTHUR. See WELLINGTON.

Wellesley, RICHARD COWLEY, MARQUIS, D.C.L., 1760–1842. Brother of Wellington; Earl of Mornington (Irish peer) 1781; M.P. 1785–86 and 1789; Lord of the Treasury 1786. Privy Councilor 1793; Baron Wellesley 1797; Gov.-gen. of India 1798–1805, where his rule is memorable for the conquest of Mysore 1799, and of the Mahrattas 1805, as also for increase of the Company's income and several reforms; Marquis 1799; Envoy to Madrid 1808–9; Sec. of State 1809–12; Lord-lieut. of Ireland 1821–28. *Dispatches*, etc., 5 vols., 1836–37; *Memoirs*, 1846.

Wellesley College. At Wellesley, Mass., 15 m. w. of Boston; founded for women by Henry F. Durant 1875. It had, in 1897, 33 professors, 41 instructors, 721 students, a library of over 46,000 vols., 13 buildings, and an income of $223,000.

Well Foundations. Method of sinking foundations used in India, a well being sunk with a stone casing and afterward filled with concrete.

Wellhausen, JULIUS, b.1844. Prof. Greifswald 1872, Halle 1882, Marburg 1885, and Göttingen 1892; rationalist, eminent in O. T. criticism. *History of Israel*, 1878, tr. 1885.

Welling, JAMES CLARKE, LL.D., 1825–1894. Ed. Washington *Intelligencer* 1856–65; pres. Columbian Coll., Washington, D. C. (Univ. 1873), from 1871.

Wellington. Capital of New Zealand since 1865; on s. end of North Island; settled 1840. Pop., 1891, 31,021.

Wellington, ARTHUR MELLEN, 1847–1895. American engineer. *Location of Railways*, 1878–87.

Wellington, ARTHUR WELLESLEY, DUKE OF, 1769–1852. Son of an Irish Earl; Ensign 1787, Lieut.-col. 1793, Col. 1796; in India 1797–1804 under his brother (see WELLESLEY), where he won sundry battles, and was made Gov. of Mysore 1799, Major-gen. 1802, and knight 1804; M.P. 1806; Lieut.-gen. 1808; made Baron and Viscount 1809 for victories in Portugal; Commander-in-chief in Spain 1809–14, where he defeated the French

Duke of Wellington.

at Badajos, Salamanca, and elsewhere, and was made Earl 1812, Field-marshal 1813, Marquis and Duke 1814. Now covered with titles, honors, and rewards, he reached the pinnacle of glory by crushing Napoleon at Waterloo, June 18, 1815. As Prime Minister, 1828–30, he lost much of his popularity by opposing inevitable reforms. Personally he was upright, generous, and unostentatious. His *Dispatches*, pub. 1852–80, fill 33 vols.

Wellington College. Public school in Berkshire, Eng., founded 1853 in memory of Wellington, with funds raised by subscription. Its scholarships are for the sons of deceased army officers.

Wellingtonia. Genus of trees to which the name *Sequoia* was formerly given. See RED-WOOD.

Wells. Pits sunk to arrive at springs, for obtaining water. Formerly, wells were simply pits sunk into the ground, until water was reached. These pits were lined or not, according to the hardness of the earth or rock passed through. These open wells have been greatly superseded by artesian wells. See ARTESIAN WELL and DRIVEN WELL.

Wells, CHARLES JEREMIAH, 1800–1879. English poet. His *Stories after Nature*, 1822, and *Joseph and his Brethren*, 1824, were highly praised by Swinburne.

Wells, CLARK HENRY, U.S.N., 1822–1888. Active in the taking of Mobile 1864; Captain 1871, Commodore 1880, Rear-admiral 1884.

Wells, DARIUS, 1800–1875. Printer in N. Y. and N. J.; inventor of improvements in types.

Wells, DAVID AMES, LL.D., D.C.L., b.1828 in Mass. Economist and reformer; U. S. Commissioner of Revenue 1866–70; active writer on finance and the tariff. *Crusoe's Money*, 1876; *Merchant Marine*, 1882; *Catechism*, 1888.

Wells, HENRY, 1805–1878. Pres. American Express Co. 1860–68.

Wells, HORACE, 1815–1848. Dentist at Hartford, Conn. In 1844 he proved the efficacy of nitrous oxide in producing anæsthesia; his claim antedates those of Drs. Morton and Jackson. Failing to gain the due credit and profits of his discovery, he died insane.

Wells, SAMUEL ROBERTS, 1820–1875. American writer and lecturer on phrenology.

Wells, SIR THOMAS SPENCER, M.D., d.1897. Reviver of ovariotomy 1855; Baronet 1883.

Wells, WILLIAM CHARLES, M.D., F.R.S., 1757–1817. B. in S. C.; practitioner in London from 1785; forerunner (1813) of Darwin as to natural selection. *Single Vision*, 1792; *Essay on Dew*, 1814.

Wells College. At Aurora, N. Y.; for women; incorporated 1868. In 1896 it had 20 teachers and 80 students.

Wellwood, H. See MONCREIFF.

Welsbach, CARL AUER VON, b. ab.1860. Austrian chemist who investigated the rare earths, separated didymium into two elements, praseodymium and neodymium, and in 1886 invented the incandescent gas light which bears his name. This consists of a cylindrical mantle 0.9 in. diameter, 4 in. long, which is coarsely woven of thread and is then dipped in a water solution of thorium nitrate, containing cerium nitrate and other salts to vary the light or strengthen the mantle. This is subsequently dried and ignited, which leaves a skeleton of the oxides. When this is heated over a Bunsen burner it produces an intense incandescent light, reaching 27 candle-power per cu. ft. of gas, and a life of 600 hours.

Welsby, WILLIAM NEWLAND, 1803–1864. English editor of law books. *Judges of 17th and 18th Centuries*, 1846.

Welsh. Language of Wales; branch of the Celtic family, with literature from the 12th century. The word was applied by different peoples to any strange nations; so Italians are "Welsh" to the Germans. See WALLACHIAN.

Welsh, ALFRED HIX, b.1850. Prof. Ohio Univ. 1885; author of text-books.

Welsh, JOHN, LL.D., 1805–1886. Phila. merchant; pres. Centennial board of finance 1873–76; U. S. Minister to England 1878–80.—His son, HERBERT, b.1851, founded the Indian Rights Association 1883.

Welsh, THOMAS, 1824–1863. Pa. Colonel 1861; Brig.-gen. U. S. Vols. 1863, serving in Va. and Miss.

Welsh Music. Admittedly the most beautiful, as it surely is the most ancient, British folk music, traditionally including relics of the art of the old Britons. The Welsh are the most industrious cultivators of music in Great Britain, and have carried their fondness for choral singing, as well as their contests in composition and performance, wherever they have gone. Their harp is the most perfect of the ancient instruments of the Islands. Tradition ascribes an age of 1,100 years to the tune, "Plain of Rhuddlan." The favorite Welsh dance is the jig.

Welsh Pony. See HORSE.

Welshpool. Town of Montgomeryshire, North Wales, 20 m. s.w. of Shrewsbury, on the Severn. Formerly it was the center of the flannel trade, but this has now been transferred to Newtown. Near is Powis Castle (12th century) with beautiful grounds. Pop. 6,500.

Welwitsch, FRIEDRICH, 1806–1872. Austrian botanist, long in Africa; discoverer of a long-lived plant, named from him.

Wemyss, FRANCIS CHARTERIS DOUGLAS, EARL OF (LORD ELCHO), b.1818. M.P. 1841; Lord of the Treasury 1852–55; leader in the Volunteer movement; Earl 1883.

Wemyss, FRANCIS COURTNEY, 1797–1859. Anglo-American actor, manager, and writer on the stage.

Wen. Tumor situated in the skin or subcutaneous tissue, found most frequently on the scalp and varying in size from less than a pea to an orange. It consists of a wall and contents. Originally a sebaceous gland whose contents have been confined through the closing of its duct. The accumulating secretion causes the tumor, and the cell walls hypertrophy, as the pressure increases from within. They are easily removed by incision.

Wenceslas, or WENZEL, 1361–1419. Son of Charles IV.; King of Bohemia 1364; German emperor 1378; deposed 1400. Sigismond, his own brother, headed a conspiracy against him

Seal of King Wenceslas.

for the partiality he showed toward the Germans. He soon lost all control in Germany and sold Lombardy to one of the Visconti.

Wend. Slavonic dialect still spoken in Lusatia in Germany, but rapidly losing ground to German, amid which it forms what is called a Speech-island.

Wendell, BARRETT, b.1855. Prof. Harvard 1888. *Emilia*, 1885; *English Composition*, 1891; *Cotton Mather*, 1891.

Wendell, JOHN LANSING, 1785–1861. Reporter N. Y. Supreme Court. *Reports*, 26 vols., 1829–42; *Digest of Cases*, 1836.

Wenderoth, GEORG WILHELM FRANZ, 1774–1861. Prof. Botany at Marburg. *Lehrbuch der Botanik*, 1821; *Flora Hassiaca*, 1846.

Wends. Slavic tribes which occupied n. Germany ab.500. Ab. 170,000 remain, chiefly in Prussia and Saxony.

Wendt, HANS HINRICH, b.1853. Prof. Heidelburg 1885, Jena 1893. *Teaching of Jesus*, 1886–90, tr. 1892.

Wener, LAKE. In s. Sweden; area 2,150 sq. m.

Wenlock Shale. Division of the English Upper Silurian, corresponding to the Niagara in America. See COLUMN and SILURIAN.

Wensleydale, JAMES PARKE, BARON, 1782–1868. Judge of Exchequer 1831; life Peer 1855; Baron 1856.

Wentworth, BENNING, 1696–1770. Gov. of N. H. 1741–67. His liberal grants of land in s. Vt. led to troubles with N. Y., which long claimed that region. His second wife, m.1760, was celebrated by Longfellow.—His nephew, SIR JOHN, LL.D., 1737–1820, an accomplished man of pure, gentle, and noble character, was Gov. of N. H. 1768–75, and benefactor of Dartmouth Coll. Divided between loyalty and patriotism, he went to England 1775, was Lieut.-gov. of Nova Scotia 1792–1808, and was made Baronet 1795.—His cousin, JOHN, 1745–1787, was an active patriot.—Another JOHN, 1768–1816, pub. *System of Pleading*, 10 vols., 1797.

Wentworth, JOHN, 1815–1888. Ed. Chicago *Democrat* 1840–61; M.C. 1843–51, 1853–55 and 1865–67; Mayor of Chicago 1857–63. *Wentworth Family*, 1878.

Wentworth, THOMAS. See STRAFFORD.

Wentworth, WILLIAM, 1615–1697. Founder of Exeter, Mass., 1639, and of the American family.

Wenzel. See WENCESLAS.

Werden, REED, U.S.N., 1818–1886. Active on the Atlantic Coast 1861–64, and in the Gulf 1864–65; Captain 1866, Commodore 1871, Rear-admiral 1875.

Werder, AUGUST, GRAF VON, 1808–1887. Prussian general, prominent in the wars with Austria, 1866, and France, 1870–71; ennobled 1879.

Weregild, or WERGILD. Mediæval fine for homicide, proportioned to the victim's rank.

Werewolf. In Mediæval superstition, one who by compact with Satan could at will assume a wolf's body. The notion still exists in parts of Europe.

Werff, ADRIAAN VAN DER, 1659–1722. Most frivolous of Dutch artists. His ivory-like finish and soulless art are well

The Holy Family, by Werff.

represented in Dresden. The *Magdalen* there, long attributed to Correggio, is his work, but its execution, which imitates Italian methods, differs from his usual style.

Wergeland, HENRIK ARNOLD THAULOW, 1808–1845. Norwegian lyric, epic, and dramatic poet. *Works*, 9 vols., 1852–57.

Werner, ABRAHAM GOTTLOB, 1750–1817. Prof. of Mineralogy in Freiberg 1815; leader of the school of neptunists as opposed to the plutonists; investigator of the highest rank in the field of economic geology. His *Neue Theorie über die Entstehung der Gänge*, 1791, is one of the most important contributions ever made to the world's knowledge of the modes of occurrence of ore-deposits. His lectures attracted students from every part of Europe and raised a small School of Mines to high rank. He was the first to extend the study of mineralogy to the phenomena observed in the structure of the globe and to point out their application to the practical purposes of mining. But while the study of geology was in many ways promoted by his labors, it was also retarded by his bold and sweeping generalizations and the implicit faith with which his doctrines were generally received. See NEPTUNISM and PLUTONISM.

Werner, E. See BÜRSTENBINDER, ELIZABETH.

Werner, FRIEDRICH LUDWIG ZACHARIAS, 1768–1823. German dramatist, noted for his exaltation of Fate; R. C. priest from 1814. *Luther*, 1806.

Wernerite. Most common representative of the scapolites, a group of minerals consisting essentially of silicates of

aluminium, calcium, and sodium, in varying proportions, and tetragonal in crystallization.

Wernwag, LOUIS, 1769–1841. German-American engineer, builder of bridges at Fairmount (Phila.), Harper's Ferry (Va.), and elsewhere; invented a stove for anthracite coal 1819; designer of Fairmount waterworks.

Werther. Hero of Goethe's sentimental romance, 1774.

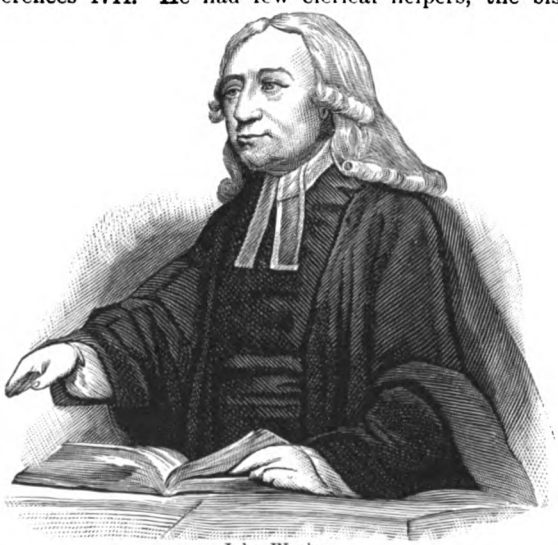
Wertmuller, ADOLPH ULRIC, 1751–1811. Swedish painter, in the U. S. from 1797; eminent as a colorist. He produced several portraits of Washington.

Wesel, JOHANN VON, 1419–1481. German humanist, teacher at Erfurt ab.1445–60; condemned 1479 for attacking indulgences. He died in prison.

Weser. River of w. Germany, formed by the Werra and the Fulda. It flows n. ab.250 m. to the North Sea.

Wesley, CHARLES, 1708–1788. Brother and associate of John; eminent for eloquence, piety, and lyrical power; in Ga. 1735–36; itinerant till after his marriage, 1749; most brilliant of English hymnists, and probably the most voluminous of lyric poets in any language; chief author of some 60 books and tracts, 1739–85, containing ab.6,000 pieces of sacred verse, reprinted in 13 vols. 1868–72. His hymns have far more grace, delicacy, and fervor, than those of Dr. Watts: their chief faults are extreme subjectiveness and a tendency to unrestrained emotion. Their use was long confined chiefly to the two branches of Methodism, but many of them are now found everywhere.—His sons, CHARLES, 1757–1834, and SAMUEL, 1766–1837, and grandson, SAMUEL SEBASTIAN, 1810–1876, were eminent as organists and composers.

Wesley, JOHN, 1703–1791. Founder of Methodism; in Ga. 1735–38; deeply influenced by Moravians; thenceforth in the British isles, itinerating and organizing; much in controversy and long under great obloquy. He was a strong preacher, a devoted worker, and an admirable executive. His first societies were formed in London and Bristol 1738–39: here his success was immense. Class-meetings were begun 1742, and conferences 1744. He had few clerical helpers, the bishops



John Wesley.

and clergy generally disapproving and sometimes denouncing the movement; but he formed a body of active lay-preachers, who exhibited much heroism, and often, like himself, endured persecution. His converts were drawn alike from the Ch. and from dissent: he attended and observed the Ch. services, disclaimed any idea of setting up a rival body, and was carried to the grave by Ch. clergymen. By that time there was ab. 80,000 Methodists. He wrote some 40 hymns, mostly tr. from the German, some of them of very high quality.

Wesley, SAMUEL, 1662–1735. Rector of Epworth, Lincolnshire, 1697; poet; father of John and Charles. *Life of Christ*, 1693; *Hist. O. and N. T.*, 1701.—His wife, SUSANNA (ANNESLEY), 1669–1742, was of memorable gifts and labors.—Their eldest son, SAMUEL, 1690–1739, usher at Westminster School 1715 and headmaster at Tiverton 1732, had no sympathy with his brothers. Some of his *Poems*, 1736, are of very marked ability.

Wesleyan Methodist Connection of America. Minor Methodist body, seceding as abolitionists 1839; non-episcopal and anti-masonic. It admits lay representation, and has ab. 300 ministers and 20,000 members.

Wesleyans. See METHODISM.

Wesleyan University. At Middletown, Conn.; opened 1829 by M. E. Ch. It offers three courses of study, and has admitted women since 1872. It has an observatory, with laboratories for physics, chemistry, and mechanics. Its funds, buildings, and collections have received large additions in recent years. It had, in 1897, 25 instructors, 307 students, and a library of 46,000 vols.

Wessel, JOHAN HERMAN, 1742–1785. Norwegian-Danish dramatic and satirical poet.

Wessel, JOHANN, or GANSFORT, ab.1419–1489. Dutch-German humanist; one of the advance-guards of the Reformation. Some of his writings were burned; others Luther pub. 1522.

Wesseling, PETER, 1692–1764. Prof. Franeker 1723, and Utrecht 1735; ed. Diodorus and Herodotus.

Wessels, HENRY WALTON, U.S.A., 1809–1889. Brig.-gen. U. S. Vols. 1862–65, serving in Va. and N. C.; captured with his troops at Plymouth, N. C., April 21, 1864.

Wessex. Saxon kingdom in s. England from 519. It subjugated Sussex ab.685, Mercia, Kent and Essex 825, and Northumbria 841.

West, BENJAMIN, 1738–1820. American painter, in London from 1763; pres. Royal Academy 1792–1815; of inferior talent, but great temporary repute, especially for his historical pictures.

West, JOSEPH RODMAN, b.1822. Brig.-gen. U. S. Vols. 1862–65; Senator from La. 1871–77.

West, LIONEL SACKVILLE, b.1827. British Minister to Madrid 1878–81, and to Washington 1881–88; Baron Sackville 1888.

West, STEPHEN, D.D., 1735–1819. Pastor at Stockbridge, Mass., 1759–1818; theological writer. *Life of S. Hopkins, D.D.*, 1806.

West Bromwich. Borough of Staffordshire, 5 m. n.w. of Birmingham. It has manufactures of hardware. Pop., 1891, 59,489.

Westbury, RICHARD BETHELL, LORD, 1800–1873. M.P. 1832; Knight and Solicitor.-gen. 1852; Atty.-gen. 1856–58 and 1859–61; Baron 1861; Lord Chancellor 1861–65; law reformer.

Westcott, BROOKE FOSS, D.D., D.C.L., b.1825. Prof. Cambridge 1870; Canon of Westminster 1884; Bp. of Durham 1890; commentator on St. John; ed. (with Hort) Greek N. T., 1881. *Canon of N. T.*, 1855; *Study of Gospels*, 1860; *Bible in Ch.*, 1864; *Gospel of the Resurrection*, 1866.

Westcott, JAMES DIAMENT, 1802–1880. Sec. of the territory of Fla. 1830–34; U. S. Senator 1845–49.

Westcott, THOMPSON, 1820–1888. Phila. journalist and historical writer.

Westerman, HANS, 1660–1721. French traveler in S. America, Mexico, and W. Indies. *Voyage*, 1715.

Westermann, ANTON, 1806–1869. Prof. Leipzig 1834–65; writer on Greek classics.

Western, PAULINE LUCILE (MRS. J. H. MEAD), 1843–1877. American actress.

Western Australia. British colony in Australia, w. of 129th meridian; organized 1890; area 978,000 sq. m. The country is mainly an arid plain, covered with bush, occasionally with trees, and varied by a few ranges of hills. Capital, Perth; pop., 1891, 53,285, excluding natives.

Western College. Founded 1856 by United Brethren at Western, Ia.; removed to Toledo, Ia., 1881; co-educational. It has (1897) 12 instructors and 235 students.

Western Dwina, or DUNA. River of w. Russia, rising on the Valdai Plateau, flowing s.w. and entering the Gulf of Riga 7 m. n.w. of Riga. Length 625 m.

Western Empire. Name sometimes given to the w. provinces of the Roman Empire between 395 and 476.

Western Islands. See HEBRIDES.

Western Reserve University. Founded at Cleveland, Ohio, 1884. It embraces Adelbert Coll., founded at Hudson 1826 as Western Reserve Coll., and removed to Cleveland 1882; a medical shool organized 1844; a coll. for women opened 1888; a graduate department, a law school, and a dental school opened 1892. The two colleges have 37 instructors; the three schools have 51. There are 270 students in the colleges; in all departments, excluding an academy, 602. The library contains 30,000 vols.

Westfield. Manufacturing town of Hampden co., Mass., 9 m. w. of Springfield. Pop., 1890, 9,805.

Westfield River. River rising in the Green Mts., Mass., emptying into the Connecticut at Springfield. It affords good water power, and in its lower course is sometimes called the Agawam.

West Highland. See CATTLE.

West India Company, DUTCH. See DUTCH WEST INDIA COMPANY.

West Indies. Cuba, Haiti, Porto Rico, Jamaica, and many smaller islands, separating the Caribbean Sea and the Gulf of Mexico from the Atlantic; named by Columbus, their discoverer, who supposed that through them he had found a new route to India. The British and Dutch early established themselves here; a French settlement was established 1625. The British long used them for penal settlements. Total area of the archipelago 94,822 sq. m., pop. 4,194,700.

Westinghouse Brake. See BRAKE, WESTINGHOUSE.

Westmacott, SIR RICHARD, D.C.L., 1775–1856. English sculptor, R.A. 1816; prof. R.A. 1827; knighted 1837.—His son, RICHARD, F.R.S., 1799–1872, became R.A. 1849, and Prof. of Sculpture 1857.

Westminster. Former suburb, now part of London. Pop., 1891, 55,760.

Westminster, HUGH LUPUS GROSVENOR, DUKE OF, b.1825. M.P. 1847; Marquis 1869, Duke 1874; owner of great estates in London.

Westminster Abbey. Collegiate (formerly monastic) Ch. of St. Peter, where for over 800 years the kings of England have been crowned and her great men buried or commemorated. The Dean, within the Abbey, outranks even the Abp. of York.

Westminster Abbey.

Westminster Assembly. Held in Westminster Abbey 1643–52; called by the Long Parliament; composed of 121 divines, mostly Puritans, and 30 laymen. Its Confession, 1646, and Larger and Shorter Catechisms, 1647, have become the foundation of Anglo-Saxon Calvinism.

Westminster Confession of Faith AND **Catechism.** See WESTMINSTER ASSEMBLY.

Westminster Hall. Remains of the ancient palace of Westminster, built during the reign of Richard II.; it serves as a vestibule to Westminster Palace.

Westminster Palace. Building in the s.w. part of London, fronting on the Thames, in which are the meeting-rooms of the Houses of Parliament. It has a facade of 900 ft. on the e. side, and three towers of 300, 320, and 340 ft. in height.

Westminster School. One of the seven great public schools of England, founded by Queen Elizabeth 1560. It adjoins the Abbey. At Christmas one of Terence's plays is performed. This is an old custom.

Westminster Standards. Church books drawn up by the WESTMINSTER ASSEMBLY (q.v.).

Westphal, JOACHIM, 1510–1574. Pastor at Hamburg from 1541; extreme Lutheran controversialist. Calvin wrote against him.

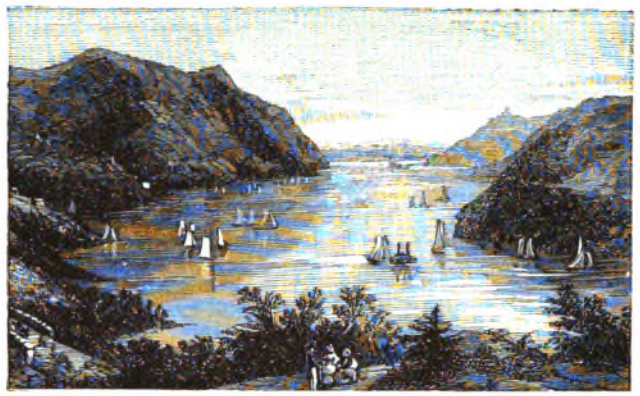
Westphal, KARL FRIEDRICH OTTO, 1833–1890. Prof. Berlin 1869; writer on nervous diseases.

Westphal, RUDOLPH, 1826–1892. German writer on Greek music and meters; prof. Moscow 1873.

Westphalia. Province of w. Prussia; duchy, under Abp. of Cologne, from 1179; mostly given to Hesse 1802; enlarged as a kingdom under Jerome Bonaparte 1807–13; reduced, and held by Prussia since 1813. Area 7,892 sq. m.; pop., 1890, 2,428,661.

Westphalia, PEACE OF. See MUNSTER, TREATY OF.

West Point. Site of U. S. MILITARY ACADEMY (q.v.); on w. bank of the Hudson, 50 m. n. of New York; noted also for noble scenery, and as Washington's headquarters 1779. It was the site of one of the most important fortresses during the Revolutionary war; ruins of Ft. Putnam still exist. Altitude 188 ft. Pop. ab. 1,500.



View from West Point.

West Point Cadet. See CADET.

Westropp, HODDER MICHAEL, 1847–1884. British writer on archæology. *Phallic Idea*, 1873.

West Troy. Village of Albany co., N. Y., on the Hudson, opposite Troy; chartered 1836; site of Watervliet Arsenal, founded by the U. S. 1807. Pop.,1890, 12,967.

West Virginia. One of the eastern States; part of Va. till 1863. Its area, 24,780 sq. m., is occupied by the Cumberland or Allegany plateau. The e. boundary follows generally the line of its escarpment: from the summit of this the general slope of the land is toward n.w., but it has been eroded by its water courses into an irregular mass of ridges and gorges. These become less pronounced and the country more open toward the w. The principal navigable rivers are the Ohio and Big Sandy, which form the w. boundary; the Kanawha, which, rising in N. C., cuts a gorge entirely through the Cumberland plateau from its escarpment to its foot; and the Monongahela, one of the head branches of the Ohio, which has been improved so as to permit of slackwater navigation. The geological structure of the State is simple. The surface rock is over almost the entire State of the Carboniferous formation, containing almost everywhere coal measures. Coal mining is rapidly becoming a large industry and bids fair in the near future to become the leading industry. In 1896, 12,541,382 tons were mined. The coal is of all varieties except anthracite. Agriculture is a very prominent industry. The value of farms in 1890 was $154,996,772, and of agricultural products in 1889 $20,439,000. Manufactures are still somewhat limited, and are almost confined to Wheeling, the principal city. Capital, Charleston. Geographical and political circumstances led to the separation from Va. The natural dividing line between the e. and w. portions was the Allegany Mts. This had of itself created two States as to commercial and political interests: as a consequence the two portions of the State were in frequent controversy. When Va. seceded, 1861, the people of the n.w. part called a convention and adopted provisions for the organization of a new State. A Constitution was adopted 1862, and the State was admitted June 1863. Pop., 1890, 762,791. (See Map, page 1650.)

West Virginia, UNIVERSITY OF. Established at Morgantown 1867; one of the land-grant colleges. It has (1897) 7 courses, 27 instructors, 164 students in collegiate courses, 89 in law, and 146 in preparatory studies.

Westwood, JOHN OBADIAH, 1805–1893. English entomologist.

Wetherell, ELIZABETH. See WARNER, SUSAN.

Wetherell, EMMA (ABBOTT), 1849–1891, m.1874. American singer.

Wetherill, SAMUEL, 1736–1816. Phila. patriot; founder of a society of Free or "Fighting Quakers" 1781.—His great-grandson, SAMUEL, 1821–1890, invented processes for zinc white, and founded zinc works at S. Bethlehem, Pa., 1853.—His cousin, CHARLES MAYER, 1825–1871, was Prof. Chemistry at Lehigh Univ. from 1866. *Vinegar*, 1860.

Wetmore, PROSPER MONTGOMERY, 1798–1876. American poet.

Wet Rot. Rot occurring in timber under conditions of alternate dampness and dryness. See PRESERVATION OF TIMBER.

Wetstein, JOHANN JACOB, 1693–1754. Swiss Arminian, prof. Amsterdam from 1733. His ed. N. T., 1751–52, is still valued. *Prolegomena ad N. T.*, 1730.

Wette, W. See DE WETTE.

EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
83
81
77
Longitude West 79 of Greenwich
Longitude West 2 of Washington
0
4
6
37
39
KENTUCKY
OHIO
PENNSYLVANIA
MARYLAND
VIRGINIA
COLUMBUS
PITTSBURG
HARRISBURG
RICHMOND
CHARLESTON

Wetted Perimeter. Part of the outline of the cross-section of a channel or river which is in contact with the water, or below the water level. It increases directly as the frictional resistance to flow.

Wetter. Lake of s. Sweden; area 733 sq. m.

Wetterhorn, or HASLE. Mountain in the Bernese Oberland, Switzerland, e. of the Grindelwald, ab. 12 m. e.s.e. of Interlaken. Altitude 12,150 ft.

Wetzer, HEINRICH JOSEPH, 1801–1853. Prof. Tübingen 1830; R. C. theologian.

Weyden, ROGIER VAN DER, 1399–1464. Leading Flemish artist between the time of the Van Eycks and of Memling. Good examples are in the Berlin Museum and elsewhere. He

Rogier van der Weyden.

never signed or dated any of his pictures, and so their authorship and chronological order is generally a matter of internal evidence.

Weyler, VALERIANO, b. ab.1836. Spanish general, noted for severity during the Carlist insurrection and as commander in Cuba Feb. 1896–Oct. 1897.

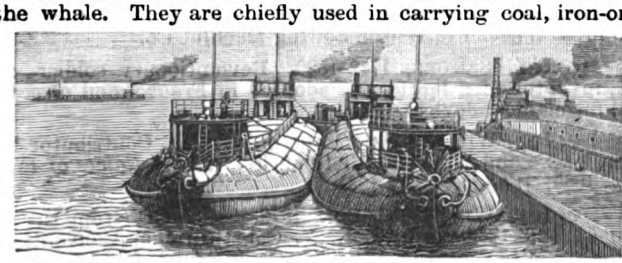
Weyman, STANLEY JOHN, b.1855. English novelist, dealing chiefly with the France of Henry IV. and succeeding reigns. *House of the Wolf*, 1889; *Francis Cludde*, 1891; *A Gentleman of France*, 1893; *Under the Red Robe*, 1894; *My Lady Rotha*, 1894; *Red Cockade*, 1895; *Shrewsbury*, 1897.

Weymouth. Town of Norfolk co., Mass., 12 m. s.e. of Boston; settled 1623. Pop., 1890, 10,866.

Weyprecht, KARL, 1838–1881. Commander, with Lieut. Payes, of an Austrian Arctic expedition 1872–74; discoverer of Franz-Josef Land.

Whahoo. *Ulmus alata.* Tall tree of the Elm family, bearing corky ridges on the branches; native of the s.e. U.S.; known as Winged Elm.

Whaleback Steamer. Designed by Alexander McDougall, of Minnesota, who built the first propeller in 1890. Its form of construction is meant to resemble the back of the whale. They are chiefly used in carrying coal, iron-ore,



Whaleback Steamer.

grain and petroleum in bulk. They are built entirely of steel and are moderate in their demand for power. One 3,000-ton vessel is 362 ft. long, 24 deep, 42 ft. beam, and makes ab.19 m. an hour, being driven by 2,600 H.-P. triple-expansion engines.

Whalebone. See BALEEN PLATES.

Whalebone Whales. See BALEEN WHALES.

Whale Oil. Blubber of the Bowhead Whale and various allied species. It is of a yellow or brown color and has a disagreeable fishy odor, removable by bleaching powder. It deposits stearin when cooled and sometimes contains valerin. Some varieties dry rapidly. It is used in soap-making, illumination and saw-hardening.

Whales. Whales fall into two divisions, those with teeth, DENTICETE (q.v.), and those with whalebone or baleen plates in the mouth (see BALEEN WHALE). The former group includes the Narwhal, Blackfish, Grampus, Porpoises, Dolphins and Sperm whales; the latter includes Rorquals, Right Whales, the Greenland Bowheads, and Biscay whales. See CETACEA and MYSTACOCETI.

Whalley, EDWARD, ab.1616–1678. Parliamentary officer, distinguished at Naseby 1645; one of Charles I.'s judges; Major-gen.; in Mass. from 1660.

Wharfage. Fees imposed for the use of a wharf; if public, the charge must be reasonable. Its regulation belongs generally to the States.

Wharncliffe, JAMES ARCHIBALD STUART WORTLEY MACKENZIE, LORD, 1776–1845. M.P. 1797; Baron 1826; introducer of an order of the Lords under which meetings, named from him, are held.

Wharton, CHARLES HENRY, 1748–1833. Rector at Burlington, N. J., from 1798; theological and controversial writer.

Wharton, FRANCIS, LL.D., D.D., 1820–1889. Phila. lawyer 1841–56; prof. Kenyon Coll., O., 1856–63; rector at Brookline, Mass., 1866; prof. P. E. theol. sem., Cambridge, 1871, and Boston Law School; solicitor U. S. Dept. of State 1885. *Criminal Law*, 1846; *State Trials*, 1849; *Conflict of Laws*, 1872; *Agency*, 1876; *Digest of International Law*, 1886.—His father, THOMAS ISAAC, 1791–1856, pub. sundry *Reports*.

Wharton, GRACE. See THOMSON, ANTHONY T.

Wharton, THOMAS, MARQUIS OF, 1640–1715. M.P. ab.1662; Whig leader, imprisoned 1677; Privy Councilor 1689; Baron 1696; negotiator of the Anglo-Scottish union 1706; Viscount and Earl 1706; Lord-lieut. of Ireland 1708–10; Privy Seal 1714; Marquis 1715.—His son and successor, PHILIP, 1698–1731, became Duke 1718, edited *The True Briton* 1723–24, went over to the Pretender ab.1716, was attainted, and died abroad. Pope called him "the scorn and wonder of our days."

Wharton, THOMAS, 1735–1778. Phila. merchant and patriot; Pres. of Pa. 1777–78.

Wharton, THOMAS, 1859–1897. Phila. journalist. *Bobbo*, etc., 1897.

Wharton Switch. Railroad switch so arranged that the rails of the main track are unbroken, the passage of a car to a turnout being effected by carrying the wheels on one side over the main track rail.

Whately, RICHARD, D.D., 1787–1863. Prof. Oxford 1830; Abp. of Dublin 1831; an independent liberal, neither partisan,

Richard Whately.

courtier, nor politician, but wise and efficient as an executive, and eminent as an author; founder, with Coleridge and Arnold,

of the "Broad Ch." movement. In thought he followed Paley and the "common sense" divines, with some improvements, as shown by his *Christian Evidences*, 1837. His *Historic Doubts relative to Napoleon*, 1819, is famous. His *Logic*, 1826, and *Rhetoric*, 1828, were long used as text-books. The long list of his works includes editions of Bacon and Paley.

Wheal, or HUEL. Cornish name for mine.

Wheat. *Triticum vulgare.* Annual grass, cultivated from prehistoric times as a food plant; of unknown origin. It is grown both as a winter and spring crop. The spring wheat is almost entirely grown w. of the Mississippi. It is harder and contains more gluten and less water than winter wheat. Wheat thrives on almost all soils, but does especially well on a rich, well-drained and cultivated clay or clay loam. It should have a very mellow seed-bed, but the subsoil should be more compact; therefore the best preparation is by plowing once and following repeatedly with the harrow and cultivator. There are numerous varieties, all divided into winter and spring; *e.g.*, amber or white, according to the color of the kernel, and smooth or bearded, according as the chaff is awned or not. The wheat crop of the world for 1897 is estimated at 2,071,489,000 bushels; of which there was produced in millions of bushels, by the U. S. 492, Russia 387, Asia Minor 316, France 269, British India 180, Germany 107, Italy 102, Spain 100, Hungary 98, Gt. Britain 52, Canada 51, Roumania 44, Argentina 37, Austria 32, Bulgaria 30, Turkey 28, Australasia 24, Belgium 21, Chili 15, Algeria 13, Egypt 11. In 1896 the U. S. produced 427,684,000 bushels, of which 27 per cent was exported.

Wheat-Ears (SAXICOLA). Thrush-like birds, mainly of the Old World, strongly marked with black and white. One species, *S. œnanthe*, inhabits the bleak northern regions of America. Its wings, tail, and a broad stripe through the eye backward are black; the upper back is ashen, and the remainder of the plumage white.

Wheatleigh, CHARLES, 1823–1895. Anglo-American actor.

Wheatley, CHARLES MOORE, 1822–1882. Pa. mineralogist, first to reduce Pa. copper ores with success.

Wheatley, HENRY BENJAMIN, b.1838. English writer, chiefly on books; editor of old texts. *Pepys*, 1880.

Wheatley, PHILLIS, ab.1753–1784. Poet of African birth, servant in Boston. She became Mrs. Peters 1778. *Poems*, 1773. *Letters*, 1864.

Wheatley, WILLIAM, 1816–1876. American actor and manager; son of SARAH (ROSS), 1790–1854, actress.

Wheaton, FRANK, U.S.A., b.1833. Brig.-gen. U. S. Vols. 1862–66, serving chiefly in Va.; Col. 1874, Brig.-gen. 1892.

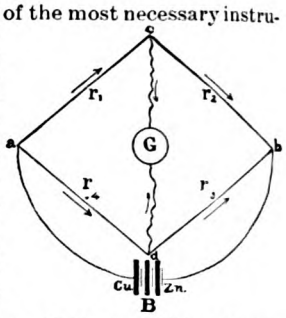
Wheaton, HENRY, LL.D., 1785–1848. Ed. New York *National Advocate* 1812–15; Judge of Marine Court 1815–19; reporter U. S. Supreme Court 1816–27; Chargé at Copenhagen 1827–35; Minister at Berlin 1835–46. His *Elements of International Law*, 1836, is of high importance. *Hist. Northmen*, 1831; *Hist. Law of Nations*, 1841 (French), tr. 1845.

Wheat Saw-fly (*Cephus pygmæus*).

Wheat Saw-fly (CEPHUS PYGMÆUS). The adult insect is ½ in. long, black, variegated with yellow. The larva is a yellowish-white grub, hatching in May from eggs deposited in the hollow stalk of the wheat. As the season advances, the grub bores toward the roots, causing the stalk to fall or bend. The next spring the grubs, having wintered in the stubble, become transformed into flies. As remedies, the stubble is burned, or rotation of crops practiced. Saw-flies belong to the *Tenthredinidæ*, a family of *Hymenoptera*, and are not true flies; *i.e.*, *Diptera*.

Wheatstone, SIR CHARLES, LL.D., F.R.S., 1802–1875. Prof. King's Coll., London, 1834; inventor of the stethoscope 1838, and other instruments; knighted 1868. *Scientific Papers*, 1879.

Wheatstone's Bridge. Arrangement of electric conductors for measuring small resistances. Its utility has been widely increased, and it is now one of the most necessary instruments in general electrical testing. In the diagram, B represents a battery, G a galvanometer, and the arrows indicate the directions of the current in the various conductors. The law of the bridge is derived from Kirchhoff's laws and may be stated thus: If the resistances r are so adjusted that the galvanometer G indicates no current in the branch c d, c and d must be at the same potential; it follows that $r_1 : r_2 = r_4 : r_3$. In practice three of the resistances are coils of wire of known value, and the fourth the unknown resistance. Suppose it to be r_1, then clearly $r_1 = \frac{r_2 r_4}{r_3}$. The battery and galvanometer are mutually interchangeable; hence the parts a b and c d are termed conjugate. Thomson has suggested a method of measuring the resistance of a galvanometer by the bridge, and Mance one for determining the resistance of a battery.

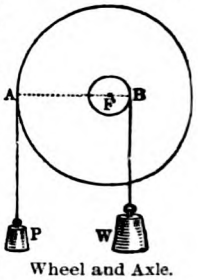


Whedon, DANIEL DENISON, D.D., LL.D., 1808–1885. Prof. Wesleyan Univ. 1832–43, and Univ. Mich. 1845–53; ed. *Methodist Quarterly Review* 1856–84. *Commentary on N. T.*, 5 vols., 1860–75; *on O. T.*, 1880–86; *Freedom of the Will*, 1864; *Essays*, 1887.

Wheel. Implement on which a criminal or victim was "broken," usually by blows of an iron bar; used in Scotland till 1604, in France till ab.1789, and in Germany till 1827.

Wheel and Axle. Simple machine, consisting of a cylinder of revolution upon which is fixed a wheel of considerably larger diameter. The power is applied tangentially to the wheel, and the weight tangentially to the axle, usually by ropes. The principle is that of the lever, the axis of the axle being the fulcrum. The mechanical advantage is given by the formula,

$$\frac{\text{Power}}{\text{Weight}} = \frac{\text{radius of axle}}{\text{radius of wheel.}}$$



Wheel and Axle.

Wheel-Animalcule. See ROTATORIA.

Wheel Base. Distance between the centers of the rear and front wheels of a car or locomotive. That of a locomotive and tender is ab. 50 ft.

Wheeler, ANDREW CARPENTER ("NYM CRINKLE"), b.1835. New York journalist and critic.

Wheeler, BENJAMIN IDE, b.1854. Prof. Cornell 1886; writer on language.

Wheeler, CHARLES STEARNS, 1816–1843. Tutor at Harvard 1838–42; editor of Herodotus 1843.

Wheeler, DAVID HILTON, D.D., LL.D., b.1829. Prof. Northwestern Univ. 1867–75; ed. N. Y. *Methodist* 1875–82; pres. Allegany Coll., Pa., 1883–87. *Brigandage in s. Italy*, 1864; *Byways of Literature*, 1883.

Wheeler, JOHN HILL, 1806–1882. Historian of N. C. 1851; U. S. Minister to Nicaragua 1854–57.—His brother, JUNIUS BRUTUS, U.S.A., 1830–1886, prof. at West Point 1866–85, pub. several text-books. *Military Engineering*, 1884–85.

Wheeler, JOSEPH, b.1836. Brig.-gen. C.S.A. 1862, Major-gen. 1863–65; able cavalry commander in Tenn. and Ga.; M.C. from Ala. 1881–83 and since 1885.

Wheeler, NATHANIEL, b.1820 in Conn. Founder (1852–53) and pres. Wheeler & Wilson Sewing Machine Co.

Wheeler, SAMUEL, 1742–1820. Revolutionary soldier of Pa., inventor of a light gun, adopted in France, and of several mechanical devices.

Wheeler, WILLIAM ADOLPHUS, 1833–1874. Contributor to Worcester's and Webster's dictionaries. *Noted Names of Fiction*, 1865; *Who wrote It?* 1881.

Wheeler, WILLIAM ALMON, 1819–1887. M.C. from N. Y. 1861–63 and 1869–77; pres. N. Y. Constitutional Convention 1867–68; author of the Wheeler Compromise for La. 1876; Vice-Pres. of the U. S. 1877–81.

Wheeling. Chief city of W. Va., and its capital 1865–70 and 1875–85, as now of Ohio co.; on the Ohio, 63 m. s.w. of Pittsburg; site of Fort Henry, attacked by Indians and British 1777 and 1781–82; settled 1793, chartered 1806 and 1836. It has considerable manufactures, especially of iron and steel. Pop., 1890, 35,013.

Wheelock, ELEAZAR, D.D., 1711–1779. Pastor at Lebanon, Conn., 1735–70; teacher there of S. OCCOM (q.v.), and other Indians; first pres. of Dartmouth Coll. from 1770. *Narrative*, 1762–75.—His son, JOHN, LL.D., 1754–1817, was its pres. 1779–1815. *Hist. Dartmouth Coll.*, 1816.

Wheelwork. See GEAR WHEELS.

Wheelwright, JOHN, ab.1592–1679. Pastor in Mass. 1636; partisan of Anne Hutchinson; condemned for a fast-day sermon, and banished 1637; founder of Exeter, N. H., 1638. *Mercurius Americanus*, 1645. *Writings*, 1876.—His descendant, WILLIAM, 1798–1873, established steamship lines and built railroads in S. America, and founded the Pacific Steam Navigation Co.

Wheildon, WILLIAM WILLDER, 1805–1892. Mass. journalist and historical writer.

Whelan, RICHARD VINCENT, D.D., 1809–1874. R. C. Bp. of Richmond, Va., 1841, and of Wheeling from 1851; active in missionary and educational work.

Whelk. See RHACHIGLOSSA.

Whetstones. Slaty stone used to sharpen edge tools after grinding. See NOVACULITE and OIL STONE.

Whewell, WILLIAM, D.D., F.R.S., 1794–1866. Prof. Cambridge 1828; Master of Trinity from 1841; Vice-chancellor from 1855; prolific writer, of wide and varied learning; in philosophy a rationalist, as opposed to empiricism. *Astronomy and Physics*, 1833; *Inductive Sciences*, 1837–40; *Hist. Moral Philosophy*, 1852; *Plurality of Worlds*, 1853; *Platonic Dialogues*, 1859–61. His *Elements of Morality*, 1845, was much used in colleges.

Whewellite. $CaC_2O_4.H_2O$. Natural calcium oxalate, sometimes found in connection with coal beds.

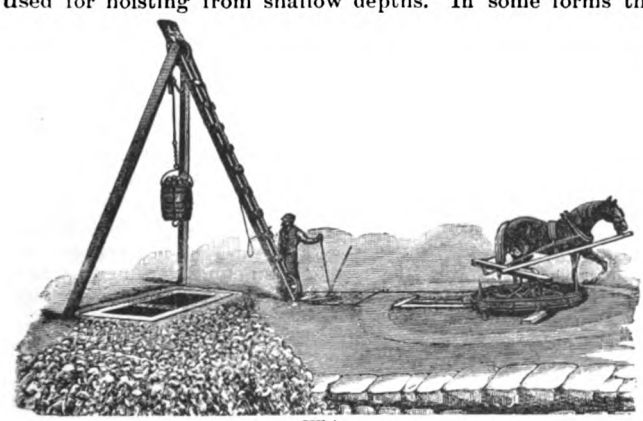
Whewell's Anemometer. Set of small plane metallic plates, arranged as windmill fans, revolving around a horizontal axis, which was kept pointed toward the wind by the wind vane.

Whey. In the process of cheese making, residue left after the casein has been separated with rennet. It contains a large part of the water, nearly all the sugar, all the albumen, a varying and small portion of the fat, and about two-thirds of the ash of the milk. It is of considerable value for feeding purposes, particularly before the sugar has turned to lactic acid. See MILK and LACTOSE.

Whichcote, BENJAMIN, D.D., 1610–1683. Cambridge Platonist of highest ability and influence; provost of King's Coll. 1644–61; called by Shaftesbury "preacher of good nature." He and his school, often called latitudinarians, cared little for forms of government and theological symbols, but were busy with abstractions: they were far ahead of their age, and developed lines of religious thought now familiar. His works were posthumous: *Aphorisms*, 1703, and *Discourses*, 4 vols., 1701–7, contain many pregnant and memorable sayings.

Whigs. 1. British Liberals ab.1650–1830, opposed to the Tories. 2. American patriots during the Revolution. 3. Party opposed to the Democrats 1828–52. The Federalists had lost control of national affairs and become disorganized. During the "Era of Good Feeling" in Monroe's administration party feeling was at an ebb; but when Jackson became Pres. the Conservative elements took alarm at his arbitrary measures and rapidly crystallized into a political organization under the leadership of Clay and Webster. The Whigs elected Harrison 1840 and Taylor 1848, but later divided into Democrats and Republicans.

Whim, or GIN. In Mining, piece of machinery resembling a windlass with a vertical axle, worked by horse power and used for hoisting from shallow depths. In some forms the



Whim.

drum is elevated on a vertical shaft, provided with a cross bar to which a pair of traces is connected. To obtain the best effect the horse should walk at the rate of 2½ m. per hour and in a track not less than 24 ft. in diameter.

Whin, or WHINSILL. Hard intrusive basaltic rock, associated with lead ores in n. England.

Whin. See DYER'S GREENWEED.

Whip, or WHIP AND DERRY. In Mining, simple contrivance for hoisting from small depths, the bucket being raised directly by a horse drawing on a rope that passes over a fixed pulley.

Whipping. See FLOGGING and KNOUT.

Whipping-Post. Stake to which criminals are tied while punished; generally abolished in English-speaking countries; still used in Delaware.

Whipple, ABRAHAM, 1733–1819. R. I. Commodore 1775; noted for his captures with two vessels named *Providence;* prisoner 1780–83.

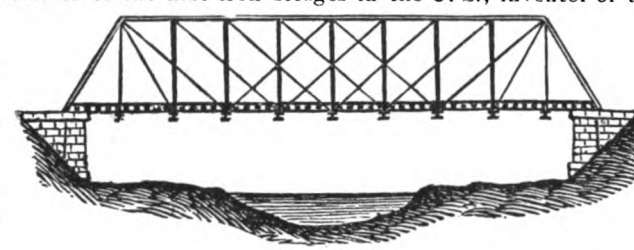
Whipple, AMIEL WEEKS, 1818–1863. Engineer; Brig.-gen. 1862; mortally wounded at Chancellorsville, Va.

Whipple, EDWIN PERCY, 1819–1886. American lecturer and critical essayist. *Literature and Life*, 1849; *Character and Characteristic Men*, 1867; *Literature of the Age of Elizabeth*, 1869; *Success*, 1871; *Works*, 6 vols., 1871; *Outlooks*, 1888.

Whipple, HENRY BENJAMIN, D.D., LL.D., b.1822. Bp. of Minn. 1859; authority on Indian questions.

Whipple, JOHN ADAMS, b.1822 in Mass. Inventor of improvements in photography.

Whipple, SQUIRE, 1804–1888. Civil engineer; designer and builder of the first iron bridges in the U. S.; inventor of the



Whipple Truss.

Whipple truss 1847. It was extensively used for long spans until 1880. It has a double system of inclined tension members with vertical posts. *Essay on Bridge-Building*, 1847.

Whipple, WILLIAM, 1730–1785. Delegate to Congress 1776 and 1778–79; signer of the Declaration of Independence; N. H. Brig.-gen. 1777–82; Judge N. H. Supreme Court from 1782.

Whipple, WILLIAM DENISON, U.S.A., b.1826. Brig.-gen. U. S. Vols. 1863–65; chief of staff to Gen. Thomas 1863; Col. 1887.

Whipple Truss. See WHIPPLE, S.

Whip-Poor-Will. See GOATSUCKERS.

Whip-Poor-Will Shoe. *Cypripedium acaule.* Purple-flowered herb of the Orchid family, native of e. N. America; known also as Stemless Ladyslipper.

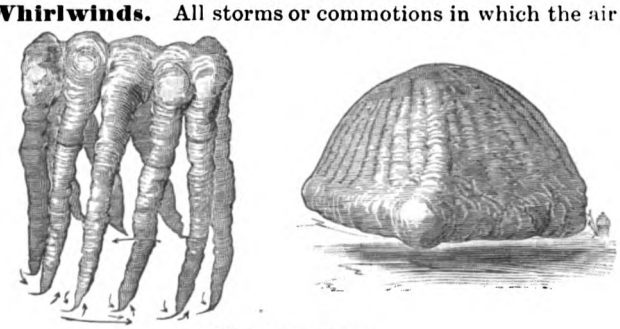
Whip Snake. See COLUBRIDÆ.

Whirled Thermometer. One attached to a swivel or to a more complex whirling apparatus, by which it is rapidly whirled round in a small circle and made to attain the temperature of the air more nearly than it would do if standing still; first used by Saussure 1788; sometimes entitled Thermometre à fronde.

Whirl Pillars. Waterspout or its imperfect development, as a small whirlwind of spray and cloud.

Whirlpool. Rapidly-whirling current, produced by the meeting of two rapid opposing currents. Among the best known are the Maelström, off the coast of Norway; Euripius, off the island of Negropont; Charybdis, in the Strait of Messina; Corrievrekin, between the islands of Scarba and Jura, in Scotland; and that below the Niagara Falls.

Whirlwinds. All storms or commotions in which the air



Whirlwinds of Dust.

describes a path around a central region. The circular theory of storms assumes this path to be nearly a circle; the more cor-

rect modern view is that each particle in describing the first portion of its path approaches the central region and also ascends; it then recedes from the center, and eventually descends. This term and description apply equally to the smallest dust-whirls, the tornadoes, and the largest cyclone.

Whisky. Alcoholic liquor obtained from the fermentation and distillation of materials containing starch or sugar. In Scotland malt is used; in Ireland one-third malt with barley, oats and corn; in England raw cereals with malt; in Scotland and Ireland a few large manufacturers also follow the last method: on the Continent they use beet-root and the potato. In the U. S., rye, corn, wheat and malt are used. In making whisky in the U. S., the husk is removed from the grain by a machine, and the kernels are ground between millstones or crushed between rollers. The meal is then placed in a mash-tub of iron or wood, with water at 150° F., 40 gals. to a bushel of grain, and free steam blown through it for 50 minutes. This is to break open the starch cells of the grain. The malt is now added, to convert the starch into sugar, and it is allowed to stand one hour. It is then cooled down to 75° F., and transferred to the fermenting tub, which is closed. The yeast is added to convert the sugar into alcohol, which requires from 48 to 72 hours. It is then called beer or wort, and is run to the beer wells. It is then distilled by steam in the copper beer still, and the low wines condensed in the worm; these contain 30 per cent alcohol. The low wines are redistilled in another still, called the doubler, and the high wines or whisky passes over. The whisky is then barreled. It contains ab. 50 per cent of alcohol by weight. For sour mash whisky the grain in the first operation is scalded with the slop from a previous distillation and no yeast is used. Bourbon whisky is made from 8 parts corn, 1 part rye, and 1 part malt. The yield has reached 4 gals. of proof spirit (50 per cent) to the bushel of grain. Sour mash whisky requires 8 years to ripen; the sweet mash whisky is in good condition in 5 years. The color of whisky is from the charcoal of the barrel or from caramel introduced. Whisky is chiefly alcohol (ethylic) and water; it also contains small quantities of acetic, butyric, valerianic and œnanthic ethers, and propyl, butyl and amyl alcohols. Fusel oil consists of these last named alcohols. By rejecting the first and last portions in the distillation much of this last is avoided. By age whisky improves in flavor by the evaporation and breaking up of the disagreeable flavors into others more agreeable. The production of rye whisky in the U. S. year ending June 30, 1897, was 4,269,220 gals., and of Bourbon whisky 6,113,126 gals.; withdrawn for export, Bourbon 534,085 gals., rye 13,967 gals.; remaining in distillery warehouses 72,148,220 gals. It can remain in bond 8 years, and pays a tax of $1.10 per proof gal. when taken out of bond. Proof gal. of spirits has sp. gr. .9198 at 15.6° C., and contains by weight 49.24 per cent of alcohol sp. gr. .7938; by volume it contains 57.06 per cent.

Whisky Insurrection. In w. Pa. 1794; caused chiefly by dissatisfaction with a law of Congress imposing a duty on spirits. 6,000 insurgents were in arms, but were soon suppressed.

Whist. Game of cards thought to have been developed in England from the game of Trump, which was played in the time of Henry VIII., or from Rough and honors. Whisk, a similar game, is mentioned 1621 by Taylor, the Water-Poet. Whist occurs in *Hudibras*, pub. 1663. Charles Cotton describes the game in the *Compleat Gamester*, 1674. The game was played by four persons, with 48 cards, the four deuces being discarded, the last card being turned for trump. The game was 9, honors were counted, and the players could call at eight. In the first quarter of the 18th century the full pack was used and the game made 10, called Long-whist. About 1785 the game was made five, and Short-whist resulted. The game is played by four persons, two being partners against the other two, and each endeavors to inform his partner what cards he holds by the order in which he plays them. The game is 5 and the rubber is the best of 3 games. Ace, King, Queen, Jack of trumps are honors; if held by one side they count 4; if 3 are held they count 2; if 2 are held they do not count. Each trick over 6 counts 1.

Whistler, George Washington, 1800–1849. Civil engineer of several U. S. railroads; employed by the Russian government 1842 to superintend the construction of the railroad from Moscow to St. Petersburg.—His son, James Abbott McNeil, b.1834 in Mass., in London 1863–92, and since mainly in Paris, is the most widely gifted in purely technical qualities of all American painters, and in the front rank of modern etchers. No one has ever approached him in depicting the docks and old barges of London. The banks of the Thames from the Tower to Old Chelsea, and in its upper reaches, he has made his own, and no other etcher is comparable to him in his treatment of the varied phases of that section of the river. His drawing is faultless, and no picturesque point escapes his artistic eye. His works are little more than sketches, but they show power given only to the highest artistic natures. *Art of Making Enemies*, 1890–92.

Whistle Signals. An attempt has been made to have locomotive whistle signals uniform on all roads of the country. The proposed code is in use on many roads: 2 long (— —) to start; 2 short (– –) answer to cord or other signal; 4 long (— — — —) calls in rear flagman; 2 long and 2 short (— — – –) warning to highway crossing; succession of short blasts, warning to cattle or other trespassers; 3 short, train is to back; 1 short blast, for brakes.

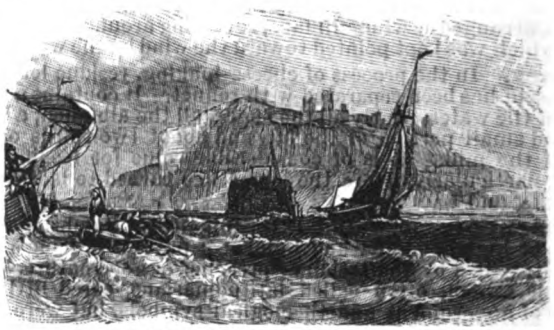
Whiston, William, 1667–1752. Prof. Cambridge 1703–10; expelled as an Arian; prolific writer, much in controversy; biographer of Samuel Clarke, 1730; translator of Josephus, 1737. *Primitive Christianity Revived*, 5 vols., 1711–12; *Primitive N. T.*, 1745; *Memoirs*, 1749–50.

Whitaker, Nathaniel, 1732–1795. Pastor in Conn. and Mass.; with S. Occom in England and Scotland 1761–63, where he raised £11,000 to endow Dartmouth Coll.

Whitaker, Ozi William, D.D., b.1830. Bp. of Nevada 1869–87, and of Pa. since 1887.

Whitaker, Walter C., 1823–1887. Col. 6th Ky. 1861; Brig.-gen. U. S. Vols. 1863–65, serving chiefly in Tenn. and Ga.

Whitby. Seaport and watering-place of Yorkshire, Eng., on both sides of the Esk, 50 m. n.e. of York. The ruins of St. Hilda's Abbey, founded 566, but rebuilt in the 11th century, marks the place where the poet Cædmon d. ab.880. The jet



Entrance to Whitby Harbor.

found here is famed over the world, and the manufacture of ornaments from it forms a special industry. Shipbuilding, herring fishing and sail cloth manufacture are also carried on. Pop. ab.14,000.

Whitby, Daniel, D.D., 1638–1726. Anglican liberal, whose *Protestant Reconciler*, 1683, was burned at Oxford, and he forced to recant. His *Commentary on N. T.*, 1703, was bound with those of Patrick and Lourth.

Whitby, Council of. Called 664 by Oswy of Northumbria to settle differences as to Easter, etc. The Roman party won.

Whitcher, Frances Miriam (Berry), 1811–1852; m.1847. Humorist of central N. Y. *Widow Bedott Papers*, 1855.

Whitcomb, James, 1795–1852. Gov. of Ind. 1843–49; U. S. Senator from 1849.

Whitcomb, John, 1713–1785. Col. of Mass. troops 1755 and later; Major-gen. 1775.

White, Albert Smith, 1803–1864. M. C. for Ind. 1837–39 and 1861–63; U. S. Senator 1839–45.

White, Andrew, ab.1579–1656. English Jesuit, missionary to Md. Indians 1633–44. His writings were pub. 1874.

White, Andrew Dickson, LL.D., b.1832. Prof. Univ. Mich. 1857–62; pres. Cornell 1867–85, and its benefactor; U. S. Minister to Germany 1879–81, and to Russia 1892–94; member of Venezuelan Commission 1896; writer on education, history and politics. *Warfare of Science with Theology*, 1896.—His cousin, Edwin, 1817–1887, was a historical painter.

White, Anthony Walton, 1750–1803. Aid to Washington 1775; Lieut.-col. 1776, Col. 1780; Gen. of cavalry 1794.

White, Canvass, 1790–1834. Engineer of the Erie, the Delaware and Raritan, and Lehigh Canals.

White, Charles Abiathar, b.1826. State geologist of Ia. 1866–70; Prof. of Natural History in Ia. State Univ. 1867–73, and at Bowdoin Coll. 1873–75; geologist and paleontologist on

the U. S. Surveys 1875–79, and since 1883, with charge of the paleontological collections in the National Museum.

White, CHARLES A., 1830–1892. Mass. writer and publisher of songs.

White, EDWARD DOUGLAS, 1795–1847. M.C. from La. 1829–34 and 1839–43; Gov. 1834–38.—His son and namesake, b.1845, was Judge of La. Supreme Court 1878–80, and U. S. Senator 1889–95.

White, EMERSON ELBRIDGE, b.1829. Pres. Purdue Univ., Ind., 1876–83; Supt. of Cincinnati schools 1883. *Pedagogy.*

White, GILBERT, 1720–1793. English naturalist, famous for the *Natural History of Selborne*, 1789.

White, HENRY CLAY, b.1850. Prof. Univ. Ga. 1872; State chemist 1880. *Chemistry of the Cotton-plant*, 1873.

White, HENRY KIRKE, 1785–1806. English poet, celebrated by Byron, and remembered chiefly for his few hymns.

White, HORACE, b.1834. Ed. Chicago *Tribune* 1864–74, and (with E. L. Godkin) New York *Evening Post* since 1883. *Money and Banking*, 1895.

White, HUGH LAWSON, 1773–1840. Justice of Tenn. Supreme Court 1801–7 and 1809–15; U. S. Senator 1825–39; opponent of Jackson; Presidential candidate 1836.—His father, JAMES, 1737–1815, founded Knoxville, 1787–91, and was Brig.-gen. of Tenn. Vols. 1813.

White, ISRAEL CHARLES, b. 1848. Assistant geologist of Pa. 1875–84; Prof. Univ. of W. Va. 1877–91. His chief work has been the adjustment of the strata on the Pa. and Ohio line, and the development and publication of the anticlinal theory of Natural Gas.

White, JOHN, 1575–1648. English Puritan, vicarious founder of Dorchester, Mass., 1630; one of the Westminster divines 1643. *Planter's Plea*, 1630.

White, JOHN BLAKE. 1781–1859. Historical painter of S. C. —Of his sons, EDWARD BRICKELL, 1806–1882, was an architect, and OCTAVIUS AUGUSTUS, M.D., b.1826, a medical writer and inventor of surgical instruments.

White, JOHN WILLIAMS, b.1849. Prof. Harvard since 1877; author and editor of classical text-books.

White, JOSEPH BLANCO, 1775–1841. B. in Spain; of Irish descent; priest till 1810, thenceforth in England; pensioned 1814; author of books against the R. C. Church and of a famous sonnet, "Night and Death," 1828. *Autobiography*, 1845.

White, JULIUS, 1816–1890. Brig.-gen. U. S. Vols. 1862–64; prisoner at Harper's Ferry, Va., 1862.

White, PEREGRINE, 1620–1704. First white child born in New England, on the *Mayflower*, near Cape Cod.

White, RICHARD GRANT, 1821–1885. American Shakespearian critic and editor, noted also as a philologist and essayist. *Shakespeare's Scholar*, 1854; *New Gospel of Peace*, 1863–66; *Words and their Uses*, 1870; *England*, 1881.

White, WILLIAM, D.D., 1748–1836. Minister in Phila. 1773, rector 1779; chaplain of Congress 1777–85 and 1789–1801; Bp.-elect of Pa. 1786; consecrated at Lambeth, Eng., Feb. 1787; chief mover of the Convention of 1789, which organized the P.E. Ch. He exercised wide influence, and won general affection and respect. *Memoirs of P.E. Ch.*, 1820–36.

White, WILLIAM HENRY, LL.D., F.R.S., b.1845. English naval architect, engineer, and writer.

White Ants. See TERMITES.

Whiteaves, JOSEPH FREDERICK, b.1835. Anglo-Canadian paleontologist, author of numerous reports.

White Boys. Association similar to that of the RIBBONMEN (q.v.), though of an earlier date.

White Caps. See VIGILANCE COMMITTEES.

White Colors. See WHITE PIGMENTS.

White Copper. One of the names given to German silver.

White Cross Societies. Organized 1883 in Ch. of England, in the interest of purity among men. The movement spread rapidly throughout the British empire and in America.

White Damp. Accumulation of carbon monoxide gas, CO, in mines.

Whitefield, GEORGE, 1714–1770. English evangelist, associated with the Wesleys at Oxford, but later separated from them on the Divine Decrees; in America seven times; from 1748 backed by Lady Huntingdon; leader of Calvinistic Method-

George Whitefield.

ism. His personal influence was immense, but he was no organizer like Wesley: though accounted the greatest preacher of his time, his sermons are unreadable.

Whitefish. See COREGONUS, ISOSPONDYLI, and SALMONIDÆ.

White Flux. Oxidizing flux consisting of a mixture of carbonate, nitrate and nitrite of potassium. It is prepared by introducing in small portions and equal parts argol and niter into a hot crucible. It is used in assaying ores.

Whitefriars, or ALSATIA. Old precinct in London, named from a Carmelite monastery established 1241.

Whitehead, CHARLES, 1804–1862. English poet and novelist. *The Solitary*, 1831; *Jack Ketch*, 1834; *Richard Savage*, 1842.

Whitehead, PAUL, 1710–1774. English satirist.

Whitehead, WILLIAM, 1715–1785. English poet laureate 1757.

Whitehead, WILLIAM ADEE, 1810–1884. N. J. historical writer.

Whitehead Torpedo. See TORPEDO.

White Horse. In many mythologies regarded as sacred to the gods, and often kept in temples and sacred groves, for purposes of augury, as among the ancient Germans, or as the steed of the gods, ready for their service, as in Japan to-day; usually considered as a harbinger of death, or ridden by the personification of death; *e.g.*, the Pale Horse in the Apocalypse. Popular European notions about the white horse appear to survive from the mount of Odin in Teutonic myth.

White House. Executive Mansion in Washington, built 1818–29; of freestone painted white, 86 by 170 ft. Its grounds include ab.20 acres.

Whitehouse, HENRY JOHN, D.D., LL.D., 1803–1874. Bp. of Ill. from 1851.

White Lady. Traditional ghost of many castles and great houses in Germany, Bohemia, Scotland, and elsewhere; celebrated in Scott's *Monastery*.

White Lead. See LEAD CARBONATE.

White Leg. White, painful swelling of the leg, occurring, in most cases, in women who have recently given birth to children. In olden times, as the lacteal secretion ceases with the onset of the disease, it was thought to be caused by milk in the leg, and was called Milk Leg. It is now thought to be a septic infection causing a thrombosis.

White Lily Society. See TRIAD SOCIETY.

Whitelocke, BULSTRODE, 1605–1675. M.P. 1640; commissioner on various occasions; Envoy to Sweden 1653; Speaker

1656; so moderate a liberal as to be almost a trimmer. *Memorials*, 1682.

Whitelocke, JOHN, ab.1757–ab.1810. British general, defeated at Buenos Ayres July 1807; disgraced.

White Mts. Part of the Appalachians, ab. 30 m. long, covering some 800 sq. m. in n. N. H. Mt. Washington is 6,286 ft. high; at least six other peaks are over 5,000 ft. These moun-

View from Mt. Washington.

tains have many noteworthy waterfalls, among which are Artist's Silver Cascade and Ripley's. They are remarkable for wild scenery and are a favorite summer resort. The principal peaks are Mts. Washington, Jefferson and Adams.

White Nile. See NILE.

White Pigments. See BARITE, LEAD CARBONATE, and ZINC OXIDE. They are commonly adulterated with gypsum, chalk and clay.

White Plains. Capital of Westchester co., N. Y., 22 m. n.e. of New York; scene of a minor defeat of Americans Oct. 28, 1776. Pop., 1890, 4,042.

White Precipitate. $HgNH_2Cl$. White, insoluble compound, made by treating mercuric chloride (corrosive sublimate) with ammonia; called infusible in distinction from a fusible white precipitate, $Hg(NH_3Cl)_2$, made by adding a solution of mercuric chloride to a boiling solution of ammonium chloride.

White River. Left hand branch of the Arkansas, in Ark. and Mo. Drainage area 29,556 sq. m., length 380 m.; mean flow at ordinary high water 50,000 cu. ft. per sec.

Whites. See LEUCORRHEA.

White Sea. Deep indentation into the Russian coast from the Arctic Ocean.

White Ship. That in which Prince William, eldest son of Henry I. of England, set sail from Barfleur Nov. 25, 1120, struck a rock and went down with all on board save one. The Prince lost his life in an effort to save his sister.

White Sulphur Springs. Watering-place in Greenbrier co., W. Va., 227 m. w. of Richmond; formerly of great social importance, and still much resorted to in summer. Within 40 m. are several other sulphur springs. See RED SULPHUR SPRINGS.

White Swelling. Dropsy of the synovial sac lining a joint, usually due to an inflammation, synovitis. The name is usually applied to the disease as found in the knee-joint, characterized by a marked swelling unaccompanied by one of the usual signs of inflammation, redness.

White Vitriol. See ZINC SULPHATE.

Whitewash. Slaked lime, with water and glue, used on walls, fences, etc., and as a disinfectant.

Whitewater River. Tributary of the St. Francis, flowing ab. 250 m. s. through s.e. Mo. and n.e. Ark.

White-Weed. See DAISY, OX-EYE.

Whitewood. Wood of the tulip-tree.

Whitfield, HENRY, 1597–1658. Pastor at Guilford, Conn., 1637–50, and its founder; previously and later in England; writer on the Indians.

Whitfield, JAMES, D.D., 1770–1834. R. C. Abp. of Baltimore 1828.

Whitfield, ROBERT PARR, b.1828. Prof. Rensselaer Inst. 1875–78; curator of geology in Central Park Museum, New York, since 1877; writer on Paleontology.

Whitgift, JOHN, D.D., 1530–1604. Prof. Cambridge 1563; Dean of Lincoln 1571; Bp. of Worcester 1577; Abp. of Canterbury 1583; Privy Councilor 1586; severe with Puritans. *Works*, 1851–53.

Whiting. Purified chalk, used to clean glass and silverware. It is adulterated by adding white-lead.

Whiting. See GADIDÆ.

Whiting, ARTHUR, b.1861 in Mass. Composer.

Whiting, GEORGE ELBRIDGE, b.1842 in Mass. Organist and composer of masses and cantatas.

Whiting, WILLIAM, LL.D., 1813–1873. Boston lawyer; solicitor U. S. War Dept. 1862–65. His *War Powers*, 1862–63, was widely read, and exerted much influence.

Whiting, WILLIAM B., U.S.N., 1813–1883. Officer of the Coast Survey and Naval Observatory; Captain 1867, Commodore 1871.

Whiting, WILLIAM HENRY CHASE, 1825–1865. Brig.-gen. C.S.A., 1861, Major-gen. 1863; builder and commander of Fort Fisher, N. C.; prisoner Jan. 1865.

Whitlow. Inflammation involving the fingers or toes and usually the last phalanx. It may be of varying degrees of severity, from a superficial inflammation involving the nail (which will be thrown off in the progress of the disease) to an inflammation involving the periosteum. When at all deep-seated, a free incision should be made into the inflamed part, with such additional treatment as may be necessary to combat the inflammation. A felon.

Whitlow-Grass. Low herbs of the genus *Draba*, natural family *Cruciferæ*, mainly natives of the n. hemisphere.

Whitman, CHARLES OTIS, b.1842. Prof. of Zoölogy at Tokio, Japan, 1878–80; Clark Univ., Mass., 1889, and Univ. Chicago 1892; founder *Journal of Morphology*, 1887. *Embryology*, 1885.

Whitman, EZEKIEL, 1776–1866. M.C. 1809–11 and 1817–23; Judge of Me. courts 1822–41; Chief-justice 1841–48.

Whitman, MARCUS, M.D., 1802–1847. Missionary in Oregon 1836; opener of a road thither, and pioneer American settler; killed by Indians. He saved Oregon to the U. S. by journeying to Washington 1842–43 and enlightening the government as to its value, which secured its retention in the Ashburton treaty.

Whitman, SARAH HELEN (POWER), 1803–1878, m. 1828. R. I. poet; friend of Edgar A. Poe, and defender of his memory 1860.

Whitman, WALT, 1819–1892. American poet, who disdained the ordinary restraints of rhyme and meter, but whose unconventional freshness and force won many warm admirers, especially in Europe. His *Leaves of Grass*, 1855, caused no little sensation, and became the basis of controversies which are not yet ended.

Whitman College. At Walla Walla, Wash.; founded 1859, opened 1866, and rechartered 1883. It has 12 teachers and 168 students, of whom 82 are in college courses.

Whitmarsh, CAROLINE SNOWDEN, b. 1827. Mass. writer for children; compiler of *Hymns of the Ages*, 3 vols., 1859–64. She became Mrs. James Guild 1870.

Whitmer, DAVID, 1805–1888. Partaker in the alleged revelation made to Joseph Smith near Palmyra, N. Y., 1829; believer in original Mormonism, but not in its additions, which caused his secession 1838. *Address*, 1887.

Whitmore, WILLIAM HENRY, b.1836. Mass. genealogist; ed. Praed's poems, 1860, Sewall's *Diary*, 1875–82, and other works.

Whitney, ADELINE DUTTON (TRAIN), b.1824 in Mass.; m. 1843. Author of many excellent stories for girls, and of several books of verse. *Mother Goose for Grown Folks*, 1860; *Leslie Goldthwaite*, 1866.

Whitney, ANNE, b.1821. Mass. sculptor.

Whitney, ASA, 1791–1874. Manufacturer in Phila. from 1842; improver of car wheels.

Whitney, ELI, 1765–1825. Machinist of Mass.; in Ga. 1792–93, where he produced the first cotton-gin. The vast importance of this invention, which practically created the chief Southern industry, led to innumerable invasions of his rights, and for years his life was one of litigation and discouragement. In 1798 he began to manufacture firearms near New Haven; in this he made many improvements, filled many contracts, and

secured the wealth which he had previously earned but not received. Indomitable energy and patience backed his great

Eli Whitney watching the first Cotton-gin.

abilities, and made his history a memorable chapter in the beneficent but checkered annals of invention.

Whitney, JAMES AMAZIAH, LL.D., b.1839 in N. Y. Patent-lawyer. *Chinese Question*, 1880–88; *Poems*, 1886.

Whitney, JOSIAH DWIGHT, LL.D., 1819–1896. State geologist of Cal. 1860–74; prof. Harvard from 1865; engaged in early life on surveys in N. H., Ia., Wis., and the iron and the copper districts about Lake Superior. Author of many reports. *Metallic Wealth of the U. S.*, 1854; *Yosemite Guide-Book*, 1869.

Whitney, MYRON W., b.1836 in Mass. Bass singer.

Whitney, SAMUEL BRENTON, b.1842 in Vt. Composer.

Whitney, WILLIAM COLLINS, LL.D., b.1841. Corporation Counsel of New York 1875–76 and 1880–82; Sec. U. S. Navy 1885–89.

Whitney, WILLIAM DWIGHT, LL.D., 1827–1894. Brother of Josiah D.; Prof. of Sanskrit at Yale 1854, and of Comparative Philology 1870; author of Sanskrit, German, French, and English grammars, of *Study of Language*, 1867, *Life and Growth of Language*, 1876, and many treatises and articles in philological journals and transactions; ed. *Century Dictionary* 1889–91. As a teacher he has inspired some of our best scholars.

Whitney, MT. Highest summit of the Sierra Nevada, and of the U. S., excluding Alaska; in e. Cal. Altitude 14,898 ft.

Whitneyite. Cu_3As. Mineral compound of copper and arsenic, found in limited quantity in the copper region of Lake Superior.

Whitsunday. See PENTECOST.

Whittaker, FREDERICK, b.1838. Biographer of Gen. Custer 1876; novelist.—His father, HENRY, 1808–1881, pub. *Practice and Pleading*, 1852–67.

Whittaker, JAMES THOMAS, M.D., b.1843. Prof. Ohio Medical Coll. 1870–94. *Physiology*, 1879; *Tuberculosis*, 1887.

Whittemore, DON JUAN, b.1830 in Vt. Civil engineer, chiefly on Western railways.

Whittemore, THOMAS, D.D., 1800–1861. Ed. Boston *Trumpet* 1828–58. *Hist. Universalism*, 1830–60; *Life of Hosea Ballou*, 4 vols., 1854–55; *Autobiography*, 1859.

Whitthorne, WASHINGTON CURRAN, 1825–1891. Adjutant-gen. of Tenn. 1862–65; M.C. 1871–86 and 1887–91; U. S. Senator 1886–87.

Whittier, JOHN GREENLEAF, 1807–1892. New England Quaker poet, active in youth as a journalist and against slavery. His later life was peacefully spent in Mass., chiefly at Amesbury. His poems throb with indignation against wrong and cruelty, glow with love of Nature, and in some cases, as *My Psalm* and *The Eternal Goodness*, rise to the highest regions of devout feeling. His purity, earnestness, and sweetness, have made him widely beloved. His most popular book is *Snow Bound*, 1866.

Whittingham, WILLIAM ROLLINSON, D.D., 1805–1879. Prof. General Theol. Sem., New York, 1835–40; Bp. of Md. 1840; eminent for learning and character; editor of sundry books and periodicals.

Whittington, SIR RICHARD, ab.1355–1423. Mayor of London 1397, 1406, and 1419; M.P. 1416; merchant-prince, famous in legend; knighted ab.1419; benefactor of churches, schools, and hospitals.

Whittlesey, CHARLES, 1808–1886. Pioneer geologist of n. Ohio; Col. 20th Ohio Vols. 1861–62; writer on the antiquities and geology of the Western Reserve and on the Lake Superior mining region.—His uncle, ELISHA, 1783–1863, was M.C. from Ohio 1823–38, and Comptroller U. S. Treasury 1849–57 and from 1861.

Whittredge, WORTHINGTON, b.1820. American landscape painter. N.A. 1861; pres. of the Academy 1874.

Whitworth, SIR JOSEPH, LL.D., D.C.L., F.R.S., 1803–1887. English mechanical engineer, improver of rifles and cannon; Baronet 1869. *Papers*, 1858; *Guns and Steel*, 1873; *Essays*, 1882.

Whitworth Gun. Rifled cannon whose bore is hexagonal in section and has a very rapid twist. The projectiles are very much elongated and adapted to closely fit the bore. It was invented by Sir Joseph Whitworth.

Whoop. Variety of Hide and Seek; so called from the hider's call when ready to be sought.

Whooping Cough. Communicable disease marked by paroxysms of spasmodic coughing, during which the inspiration of air into the lungs is accompanied by a shrill sound, known as the whoop. It is a disease largely of childhood, usually lasting for 6 or 7 weeks and is but seldom fatal. It is claimed that the specific bacillus of the disease has been isolated.

Whorl, VERTICIL. Group of two or more leaves, borne at a single node of a stem. When only two the leaves are said to be opposite; when three or more, whorled or verticillate.

Whortleberry. Shrubs of the genus *Vaccinium*, natural family *Vacciniaceæ*, bearing edible berries; natives of the n. temperate zone and the Andes. Huckleberry and blueberry are species.

Whortleberry (*Vaccinium myrtillus*).

Whymper, EDWARD, b.1840. English mountaineer, author, and engraver; first to scale the Matterhorn 1865. *Swiss Pictures*, 1866; *Scrambles among the Alps*, 1871; *Andes of the Equator*, 1891–92.—His brother, FREDERICK, pub. *Alaska*, 1868, and *Heroes of the Arctic*, 1875.

Whyte, WILLIAM PINKNEY, LL.D., b.1824. U. S. Senator 1868–69 and 1875–81; Gov. of Md. 1871–74; Atty.-gen. 1887.

Whyte-Melville, GEORGE JOHN, 1821–1878. Scottish author of sporting and historical novels.

Wicelius, or **Witzel,** GEORG, 1501–1573. German controversialist, alternately Romanist and Lutheran. *Typus ecclesiasticus*, 5 vols., 1540–48.

Wicheren. See RAUHE HAUS.

Wichern, JOHANN HEINRICH, 1808–1881. Founder, near Hamburg, 1833, of the Rauhe Haus for ignorant and depraved children. Many others were modeled upon it. *Die innere Mission*, 1849.

Wichita. City of Sedgwick co., Kan., on the Arkansas; settled 1870; important railroad center. It has two colleges, a large trade, and some manufactures. Pop., 1890, 23,853.

Wichitas. See PAWNEES and REES.

Wick. Bundle of fibers, usually cotton threads, to lead oil to the flame, where the oil is evolved as gas to maintain combustion. It acts by capillary attraction. The best wick is braided, one thread being under tension, to bend the flame end into the outer zone of combustion, to avoid smoking.

Wickedness. Disposition toward the violation of moral laws.

Wicket. Small door in a larger one, to avoid opening the whole.

Wickham, WILLIAMS CARTER, 1820–1888. Brig.-gen. C.S.A., commanding cavalry in Va. His statue was raised at Richmond 1891.

Wickram, JÖRG, 16th cent. Earliest German novelist.

Wicksteed, PHILIP HENRY, b.1844. London pastor, author, and translator. *Ibsen*, 1892.

Wickström, JOHANN EMANUEL, 1789–1856. Prof. of Botany in Stockholm. *Conspectus litteraturæ botanicæ in Sueciæ*, 1831; *Stockholm's Floræ*, 1840.

Wiclif, or **Wycliffe,** JOHN, ab.1320–1384. English "Reformer before the Reformation"; lecturer at Oxford ab.1363; rector of Lutterworth 1374; accused of heresy 1377 and 1382; first English translator of the entire Bible. His remains were

Exhumation of Wiclif.

disinterred and burned 1415. His followers, the Lollards, were persecuted, and his doctrine practically stamped out in England; but it spread to Bohemia, and produced Huss and the Hussites.

Wicopy. See LEATHERWOOD.

Widdin. Town of n.w. Bulgaria, on the Danube; scene of a Russian defeat 1828; fortified Turkish post till 1878. Pop. ab.14,500.

Wide Gauge. See BROAD GAUGE.

Widor, CHARLES MARIE, b.1845. French organist and composer.

Widukind. See WITTEKIND.

Wieck, CLARA. See SCHUMANN, R.

Wiedersheim, ROBERT ERNST EDUARD, b.1848. Prof. Freiburg 1876; writer on anatomy.

Wieland, CHRISTOPH MARTIN, 1733–1813. German epic poet and novelist, popular rather than profound; Prof. Erfurt 1767; at Weimar from 1772. Tr. Shakespeare 1762–66; *Agathon*, 1767; *Oberon*, 1780. *Works*, 42 vols., 1794–1802.

Wieliczka. Town of w. Galicia, 6 m. s.e. of Cracow; site of important salt mines, worked since ab. 1350. Pop. ab. 6,300.

Wieniawski, HENRI, 1835–1880. Polish violinist and composer; in America 1872–74; Prof. Brussels Observatory 1873.—His brother, JOSEPH, b.1837, pianist and composer, was conductor at Warsaw 1871–77.

Wier, JOHANN, 1516–1588. Physician and scholar of Cleves, pupil of Cornelius Agrippa; writer against belief in witchcraft 1563. His *Pseudomonarchia Dæmonum* (perhaps satirically) enumerates the population of hell as 72 princes and 7,405,926 minor devils. These writings caused much commotion, and were stigmatized by the eminent Jean Bodin (1530–1596) "as horrible blasphemies." The Duke of Cleves protected W. from persecution.

Wiertz, ANTOINE JOSEPH, 1806–1865. Flemish painter, founder of the Musée Wiertz at Brussels; distinguished for audacity, literary suggestiveness, and technical facility. To show that criticism was not wholly just to his art, he sent a Rubens to the Paris Salon after erasing the signature and substituting his own name, thus causing its rejection.

Wiesbaden. Old town of Prussia, on the Salzbach; former capital of Nassau; contains mineral springs, and is a noted resort of health seekers, as till 1872 of gamblers. There are 20 springs, 104°–156° F., curative of dyspepsia, gout and nervous diseases. Pop., 1890, 64,692.

Wife. See HUSBAND AND WIFE and MARRIAGE.

Wiffen, JEREMIAH HOLME, 1792–1836. English poet, tr. of G. de la Vega, 1823, and Tasso, 1824–25.—His brother, BENJAMIN BARRON, 1794–1867, edited the *Works of Spanish Reformers*, 29 vols., 1848–69.

Wig. False head of hair; the hair being fastened into a fabric or false scalp. The Egyptians wore false beards on the chin. Well constructed wigs are found in the tombs of Egypt. Wigs for judges and barristers in England are made of horse hair; actors' wigs often of jute.

Wigan. Manufacturing borough of Lancashire, Eng., on the river Douglas, 18 m. n.e. of Liverpool. Large deposits of cannel coal occur near by. Pop., 1891, 55,013.

Wigand, ALBERT, 1821–1886. Prof. of Botany in Marburg 1860. *Grundlegung der Pflanzen-Teratologie*, 1850; *Intercellularsubstanz und Cuticula*, 1850; *Der Baum*, 1854; *Mikroscopische Untersuchungen*, 1872.

Wigfall, LOUIS TREZEVANT, 1816–1874. U. S. Senator from Texas 1860–61; Brig.-gen. C.S.A. 1861–62; Confederate Senator 1862–65.

Wigger, WINAND MICHAEL, D.D., b.1841. R. C. Bp. of Newark, N. J., 1881.

Wiggin, KATE DOUGLAS (SMITH). American author, writing much for children and on kindergartens. She became Mrs. Figgs 1896. *A Summer in a Cañon*, 1889; *Marm Lisa*, 1896.

Wiggins, CARLETON, b.1848. Landscape painter of Brooklyn, N. Y.

Wigglesworth, MICHAEL, 1631–1705. Pastor at Malden, Mass., from 1657. His poem, *The Day of Doom*, 1662, reflecting the severe views of his age, had great popularity, and was reprinted 1867.—His son, EDWARD, D.D., 1693–1765, was Prof. of Theology at Harvard from 1722, as was his son, EDWARD, D.D., 1732–1794, from 1765.—His grandson, EDWARD, 1804–1876, was assistant ed. *Encyc-Americana*, 1828–32.—A cousin, EDWARD, 1742–1826, was Col. of Mass. troops 1776–79.

Wight, ORLANDO WILLIAMS, M.D., 1824–1888. American writer, compiler, and translator. *Philosophy of Sir W. Hamilton*, 1853; *Abelard and Héloise*, 1853–61.

Wight, PETER BONNETT, b.1838 in New York. Architect in Chicago since 1871; improver of fire-proof buildings.

Wight, ROBERT, 1796–1872. Anglo-Indian botanist. *Botany of India*, 1834; *Prodromus Floræ Peninsulæ Indiæ orientalis*, 1840–56.

Wight, ISLE OF. In English Channel, off Hampshire. Here is Osborne House, the seaside residence of Queen Victoria. Area 145 sq. m.; pop., 1891, 78,718.

Wigram, SIR JAMES, 1793–1866. English lawyer, 2d Vice-chancellor 1841–50; knighted and pensioned 1850; writer on wills.

Wikoff, HENRY ("CHEVALIER"), 1813–1884. American traveler, in Europe from 1834. His erratic deeds and adventures are described in *My Courtship*, 1855, *Roving Diplomatist*, 1856, and other books.

Wilamowitz-Möllendorf, ULRICH VON, b.1848. Prof. Greifswald 1876, and Göttingen 1883; editor of, and writer on, Greek classics.

Wilberforce, WILLIAM, 1759–1833. M.P. 1780–1825; active in many philanthropic movements, especially that against the slave trade, which, after 20 years' devoted labor on his part and

William Wilberforce.

Clarkson's, was abolished 1807. With equal zeal he fought slavery in the British colonies, and just lived to see it destroyed. His *Practical View*, 1797, was widely circulated and translated. *Correspondence*, 1840.—His son, SAMUEL, D.D.,

1805–1873, Bp. of Oxford 1845 and of Winchester 1869, was eminent for social brilliancy, administrative activity and power, eloquence, and wit. *Hist. P.E. Ch. in America*, 1844. His father's *Life*, 5 vols., 1838, was by him and his brother, ROBERT ISAAC, 1802–1857, who became prebendary of York 1841, and entered the R. C. Ch. 1854. *Baptism*, 1849; *Eucharist*, 1853.

Wilbour, CHARLES EDWIN, 1833–1896. American Egyptologist and translator.

Wilbrandt, ADOLF, b.1837. German dramatist and novelist.

Wilbrord. See WILLIBROD.

Wilbur, HERVEY BACKUS, M.D., 1820–1883. Director State asylum for idiots at Syracuse, N. Y., from 1854.—His brother, CHARLES TOPPAN, M.D., b.1835, has done similar work in Ill. since 1865.

Wilbur, JOHN, 1774–1856. Quaker preacher in R. I.; disowned 1843 for opposing J. J. Gurney; founder of a society named from him. *Journal*, 1859.

Wilbye, JOHN, ab.1564–ab.1612. English composer, chiefly of madrigals, between 1598 and 1614.

Wilcox, CADMUS MARCELLUS, 1826–1890. Brig.-gen. C.S.A. 1861, Major-gen. 1863–65, serving chiefly in Va. *Rifle Practice*, 1859.

Wilcox, CARLOS, 1794–1827. Conn. poet.

Wilcox, ELLA (WHEELER), b. ab.1845 in Wis.; m.1884. Poet, in New York since 1887. *Poems of Passion*, 1883.

Wilcox, PHINEAS BACON, 1798–1863. Author of Ohio *Reports*, and other law-books.

Wild. Uncultivated plants, especially those that are native.

Wild, EDWARD AUGUSTUS, 1825–1891. Brig.-gen. U. S. Vols. 1863–66, serving in N. C. and Va.

Wild, HEINRICH, b.1833. Prof. Berne 1858; director Physical Observatory at St. Petersburg since 1868; electrician and meteorologist.

Wild, JONATHAN, ab.1682–1725. English criminal and thief-taker; executed; celebrated by Fielding, 1743.

Wild Animals. See FERÆ NATURÆ.

Wild-Cat. See LYNX.

Wild-Cat. Notes of Mich. State banks adorned with the figure of a panther; thence any swindling banking or insurance business.

Wild Cherry. *Prunus serotina.* Tree growing in all parts of the U. S., attaining a height of 100 ft. in the Western States, but much smaller in the Eastern States. Its fruit is a small, blackish-purple berry. Preparations of the bark are employed to flavor medicinal preparations, as a stomachic tonic and in bronchial affections.

Wilde, OSCAR, b.1856. Irish æsthete, dramatist, novelist, and poet, of the decadent school; in America 1882; imprisoned in England 1895–97. — His mother, LADY JANE FRANCESCA (ELGER), 1819–1898, pub. *Poems by Speranza*, 1864.

Wilde, RICHARD HENRY, 1789–1847. M.C. from Ga. 1815–17 and 1827–35; in Europe 1835–40; discoverer of Giotto's portrait of Dante; law prof. Univ. La. 1845; poet. *Tasso*, 1842; *Hesperia*, 1867.

Wilde, SAMUEL SUMNER, LL.D., 1771–1855. Judge Mass. Supreme Court 1815–50.

Wilde, THOMAS. See TRURO, BARON.

Wildebeest. See GNU.

Wildenbruch, ERNST VON, b.1845. German dramatist, novelist, and poet. *Harold*, tr. 1891; *Heinrich*, 1896.

Wilder, ALEXANDER, M.D., b.1823. Prof. in New York 1873; writer on symbolism.

Wilder, BURT GREEN, M.D., b.1841. Prof. Cornell since 1867; investigator in anatomy; author of many papers.

Wilder, MARSHALL PINCKNEY, 1798–1886. Boston merchant; authority on arboriculture.

Wilderness. Region in Va., s. of the Rapidan; scene of indecisive battles, May 5–7, 1864. Union loss 5,580 killed, 28,360 wounded; Confederate loss ab.30,000.

Wild Goose. Bird of the genus *Anser* in a broad sense, which is wild or feral. In Great Britain this name is given to the graylag, and in N. America to the Canada goose, *Bernicla canadensis.* See ANSERINÆ.

Wild Huntsman. Legendary specter of the forest, of common occurrence in European folk-lore; variously explained in local tales; in the Black Forest, identified as the personification of the storm; in that of Fontainebleau, as St. Hubert; in England known as Herne the Hunter, and again as the Wandering Jew.

Wild Ipecac. Name given to Feverwort. See IPECAC, WILD.

Wild's (or TABLET) **Anemometer.** Instrument used 1666 in England, slightly modified by H. Wild 1860. It consists of a rectangular plate of thin metal hanging broadside to the wind; the strength of the wind is measured by the extent to which it causes the plate to deviate from the vertical.

Wiley, CALVIN HENDERSON, 1819–1887. N. C. author. *Alamance*, 1847; *Utopia*, 1852; *Roanoke*, 1886.

Wiley, HARVEY WASHINGTON, b.1844. Prof. in Indiana 1874; chemist U. S. Dept. of Agriculture since 1883.

Wiley, ISAAC WILLIAM, D.D., LL.D., 1825–1884. M. E. Bp. 1872.

Wilfrid, ST., 634–709. Abbot at Ripon ab.660; partisan of Rome and opponent of the Celts at the Council of Whitby 664; titular Bp. of York 664, but in possession of his see only ab. 669–670. He twice appealed to Rome, making that custom familiar in England.

Wilhead. See WILLEHAD.

Wilhelm, KARL, 1815–1873. German composer of *Die Wacht am Rhein*, 1854; pensioned 1871.

Wilhelmina, HELENE PAULINE MARIE, b.1880. Daughter of William III. of Netherlands: Queen 1890.

Wilhelmite. See WILLEMITE.

Wilhelmj, AUGUST, b.1845. German violinist, in America 1878; since in London.

Wilhelmshaven. Prussian seaport, on Jahde Bay, 45 m. n.w. of Bremen; founded 1856; strongly fortified. Pop., 1891, 15,471.

Wilhelmshöhe. Castle 3 m. from Cassel, Prussia, where Napoleon III. was held a prisoner from the capitulation of Sedan till the end of the Franco-German war. The gardens

Bird's-eye View of Wilhelmshohe.

contain splendid fountains and cascades, and the colossal statue of Hercules, within the hollow of whose club 8 persons can stand at one time.

Wilhorst, CORA (WITHERS) DE, b.1835 in New York. Singer, known in the U. S. 1856–60, and in Europe 1870–74.

Wilken, GEORG ALEXANDRE, 1847–1891. Prof. Leyden 1885; writer on the Dutch E. Indies, their ethnology and folk-lore.

Wilkes, CHARLES, U.S.N., 1798–1877. Lieut. 1826; commander of an exploring expedition in the Pacific and Antarctic Oceans 1838–42, the Reports of which filled 19 vols.; Captain 1855. While on the *San Jacinte*, he stopped the British steamer *Trent* at sea Nov. 8, 1861, and arrested J. Slidell and J. M. Mason, Confederate Commissioners to Europe. This act, extremely popular at home, endangered war with England, and the prisoners were soon released. He was made Commodore 1862 and Rear-admiral 1866. *Narrative*, 1845–51; *Western America*, 1849; *Theory of the Winds*, 1856.

Wilkes, GEORGE, 1820–1885. Ed., with W. T. Porter, New York *Spirit of the Times* from 1850. *Hist. California*, 1845.

Wilkes, JOHN, 1727–1797. M.P. 1757–64 and 1774–90; ed. *North Briton* 1762–63; long embroiled with government, and a popular hero; outlawed 1764, and in exile 1764–68; imprisoned

1768–70; Sheriff of London 1771, Lord Mayor 1774, Chamberlain from 1779. *Correspondence*, 1805.

Wilkesbarre. Capital of Luzerne co., Pa., on n. branch of the Susquehanna; in the WYOMING VALLEY (q.v.); settled 1769, chartered 1806 and 1871; surrounded by anthracite mines, and center of an important trade. Pop., 1890, 37,718.

Wilkie, SIR DAVID, 1785–1841. Scottish genre painter, who had acute perception for character and the humorous side of life, and achieved a national reputation; R.A. 1811; knighted 1836; the Dickens of British painters. His *Village Festival*, *Blind Fiddler*, and other works, are in the National Gallery.

Wilkie, WILLIAM, 1721–1772. Prof. St. Andrew's 1759; epic poet. *Epigoniad*, 1747; *Fables*, 1768.

Wilkins, JOHN, D.D., F.R.S., 1614–1672. Prebendary of York 1660, Bp. of Chester 1668; eminent for scientific attainments and writings. *Discovery of a New World*, 1638; *Mercury*, 1641; *Mathematical Magic*, 1648. *Works*, 1708.

Wilkins, MARY ELEANOR, b. ab.1860 in Mass. Novelist, eminently successful in short stories of rural New England life, as *An Humble Romance*, 1887; *Jane Field*, 1893; *Pembroke*, 1894; *Madelon*, 1896; *Jerome*, 1897.

Wilkins, PETER. Strange romance of flying islanders, 1750, by PALTOCK, ROBERT (q.v.).

Wilkins, WILLIAM, 1779–1865. Lawyer of Pittsburg; U. S. Judge for w. Pa. 1824–31; U. S. Senator 1831–34; Minister to Russia 1834; M.C. 1843–44; Sec. of War 1844.

Wilkinson, JAMES, U.S.A., 1757–1825. Capt. 1775, Major 1776, serving under Arnold and Gates; Col. 1777; Brig.-gen. under Wayne 1792; General-in-chief 1796–1798 and 1800–1812; Gov. of La. 1805–6; tried 1811 for complicity in Burr's schemes, and receiving Spanish pay; Major-gen. 1813–15; in Mexico from 1815. He held posts far above his merits, and escaped the due punishment of his traitorous intrigues. *Memoirs*, 1816.

Wilkinson, JEMIMA, 1753–1819. Fanatic or impostor, founder of a semi-Shaker sect in Yates co., N. Y., 1789. It died with her.

Wilkinson, JOHN, b.1821. Lieut. U.S.N. 1850, C.S.N. 1861; blockade-runner. *Narrative*, 1877.

Wilkinson, SIR JOHN GARDNER, D.C.L., F.R.S., 1797–1875. English traveler in Egypt 1821–33; knighted 1839. His *Ancient Egyptians*, 6 vols., 1837–41, was repub. 1879. *Modern Egypt*, 1843; *Dalmatia and Montenegro*, 1848.

Wilkinson, MORTON SMITH, b.1819. U. S. Senator from Minn. 1859–65; M.C. 1869–71.

Wilkinson, WILLIAM CLEAVER, D.D., b.1833. Prof. Rochester Theol. Sem. 1872–81; author of Chautauqua text-books. *Baptist Principle*, 1881.

Willkomm, HEINRICH MORITZ, 1821–1895. Prof. of Botany at Dorpat 1868. *Deutschlands Laubhölzer im Winter*, 1859; *Deutschen Pflanzen*, 1863.

Will. See VOLITION.

Will. Legal instrument by which one disposes of property at his death. The capacity to make it, the form in which it shall be made, the persons in whose favor it may be made, and the way in which it may be revoked, are matters largely of statutory law.

Willaert, ADRIAN, ab.1490–1562. Dutch composer, called the head of the Venetian school.

Willamette River. In Ore., branch of the Columbia,

Willamette Falls.

flowing ab.270 m. n.w. and n. between the Cascade and Coast ranges; partly navigable. It joins the Columbia a few miles below Portland; 25 m. from the mouth are W. Falls, at Oregon City, 40 ft. high, around which a canal has been constructed. Drainage area 11,700 sq. m.

Willamette University. M. E. co-educational institution at Salem, Ore., chartered 1852, and formerly known as Oregon Institute, which was founded 1844. It has colleges of liberal arts, medicine, law, theology, music, art, and oratory.

Willard, ABIJAH, 1722–1789. Mass. loyalist; Col. 1776; settler in New Brunswick.

Willard, EMMA (HART), 1787–1870. Founder of a famous girls' school at Troy, N. Y., and its head 1821–38; author of several histories and other books. *Poems*, 1830.

Willard, FRANCES ELIZABETH, 1839–1898. Prof. Northwestern Univ., Ill., 1871–74; pres. W. C. T. U. 1879; founder World's W. C. T. U. 1883, and its pres. 1888; active writer and reformer.

Willard, JOHN, LL.D., 1792–1862. Judge N. Y. Supreme Court from 1846. *Equity Jurisprudence*, 1855; *Executors*, 1859; *Real Estate*, 1861.

Willard, SAMUEL, 1640–1707. Pastor Old South Ch., Boston, from 1678; acting pres. of Harvard from 1701. *Body of Divinity*, 1726.—His great-grandson, JOSEPH, 1738–1804, was pres. of Harvard from 1781.—His son, SIDNEY, 1780–1856, was prof. there 1807–31.

Willaumetz, JEAN BAPTISTE PHILIBERT, COMTE DE, 1763–1845. French admiral 1805, Peer 1832. *Dict. de Marine*, 1820.

Willcox, ORLANDO BOLIVAR, U.S.A., b.1823. Brig.-gen. U. S. Vols. 1861–66, serving chiefly in Va.; Col. 1866, Brig.-gen. 1886. *Faca*, 1857.

Willdenow, KARL LUDWIG, 1765–1812. Prof. of Botany in Berlin. *Historia Amaranthorum*, 1790; *Grundriss der Kräuterkunde*, 1792; *Einleitung zum Seltststudium der Botanik*, 1804.

Willehad, ST., d.789. English missionary to Frisia; Bp. of Bremen 787. His day is Nov. 8.

Willekens, JACOBUS, 1571–1633. Dutch admiral, engaged against Brazil 1623–24 and 1626, and later at Manila. *Journal*, 1629.

Willemite. Zn_2SiO_4. Natural zinc silicate, found especially in Belgium and n.w. N. J.

Willems, JAN FRANZ, 1793–1846. Keeper of archives at Antwerp and Ghent; writer on Dutch language; ed. of old texts.

Willes, SIR JAMES SHAW, 1814–1872. English law reformer; Judge of Common Pleas and knight 1855.

Willets Point. U. S. military reservation at the w. end of Long Island Sound, 20 m. n.e. of New York City. It was bought by the Government in 1857 and 1863, with the intention of building a fort on it to defend the e. entrance to New York; which is not yet completed. It comprises 136 acres. It is now the site of a hospital and has a school of practice authorized 1885, and a torpedo experiment station. It also has engineers' stores and supplies.

Willett, MARINUS, 1740–1830. Lieut.-col. 1776; defender of Ft. Stanwix 1777; Commander on the Mohawk 1780–83; Sheriff of New York 1784–92; Mayor 1807. *Narrative*, 1831.

Willey, BENJAMIN GLAZIER, 1796–1867. Pastor in N. H. *Hist. White Mountains*, 1856–70.

Willey, HENRY, b.1824. Mass. writer on Lichens.

Willey, WAITMAN THOMAS, LL.D., b.1811. U. S. Senator from Va. 1861–63, and W. Va. 1863–71.

William I., "THE CONQUEROR," 1027–1087. Duke of Normandy 1035; King of England from 1066. He claimed the throne as heir of his great-uncle, Edward the Confessor, and on Harold's election invaded England and defeated the Anglo-Saxons at Hastings Sept. 29, 1066, where Harold was killed. He reduced England to complete subjection, conquered Scotland, ruled energetically, and consolidated his dynasty.—His son, WILLIAM II. (RUFUS), 1056–1100, reigned from 1087, warred with his brother Robert of Normandy, with Wales, and with Scotland, and acquired Normandy 1096.

William III., 1650–1702. King of Gt. Britain and Ireland from 1689; stadtholder of the Netherlands 1672; son of William II. of Orange and Mary, daughter of Charles I. of England. He resisted the encroachments of France, married (1677) Mary, eldest daughter of the Duke of York, afterward James II., and came to England by invitation of leading men Nov. 4, 1688, with a force of 15,000. James fled to France, and W. and Mary

were proclaimed Feb. 13, 1689. James, supported by Louis XIV., endeavored to regain his kingdom. England united with Austria, Spain and the Netherlands against France; in the war which followed, 1689–97, their armies, commanded by

King William III.

W., successfully withstood the French. He had no charm of manner, and was disliked by the English as a foreigner; but his reign is memorable in their history. Though overpraised by Macaulay, as soldier, statesman, and friend of freedom, he was the worthy scion of a great house.

William IV., 1765–1837. King of Gt. Britain and Ireland. Third son of George III.; naval Captain 1786, Duke of Clarence 1789, Admiral 1801, king from 1830. He opposed the Reform Act of 1832.

William I., 1797–1888. German Emperor; son of Frederick William III. of Prussia. Regent 1858, king 1861. The liberal party increased in power, and the chamber refused to consent to the king's measures till its constitutional powers were acknowledged. Sept. 22, 1862, Bismarck was made Prime Minister, and the chamber, having rejected the budget, was dissolved Oct. 14. The strife continued till 1863, when Bismarck made use of the Schleswig-Holstein question and the rivalry of Austria to divert attention to matters of "German" interest. The war of 1866 between Prussia and Austria ended in Prussia's triumph, and W. became head of the German Confederation 1867. The Franco-German war broke out 1870; the king commanded at Gravelotte and Sedan, and was proclaimed Emperor of Germany at Versailles, Jan. 18, 1871. His later years were full of honors.—His grandson, WILLIAM II., b.1859, succeeded his father, Frederick "the Good," June 1888, forced the resignation of Bismarck 1890, developed the Triple Alliance, and is noted for extreme activity, and assertiveness, and lofty views of prerogative and divine right. He is the friend of militarism, the JUNKERS (q.v.), and Turkish absolutism.

William I., 1772–1843. King of the Netherlands 1815–40, including Belgium till 1830; son of William V. of Orange, stadtholder. On his abdication, his son, WILLIAM II., 1792–1849, succeeded.—His son, WILLIAM III., 1817–1890, reigned from 1849.

William and Mary College. At Williamsburg, Va.; chartered 1693; oldest in the U. S., except Harvard; non-sectarian. Its work was interrupted by the Revolutionary War, by the Civil War, and by lack of funds 1882. It resumed again 1888, and in 1893 received from the U. S. $64,000 as indemnity for losses in the Civil War. Three Presidents, Jefferson, Monroe and Tyler, and many eminent men were among its graduates. It has (1897) 12 teachers and ab.150 students.

William of Malmesbury, ab.1095–1142. Author of *Historia regum Anglorum*, pub. 1596, tr. 1815.

William of Nassau, 1533–1584. Prince of Orange (in Provence); greatest of the Dutch nobles under Charles V. and Philip II. When in France as a hostage 1559, the king casually informed him of the intended extirpation of Protestants; this disclosure determined his course, and the way he received it earned his title, "the Silent." He was Gov. of Holland 1564, and on Alva's arrival escaped by flight the fate of Egmont and Horn. He and his brothers devoted their fortunes and lives to the task of liberation, against apparently hopeless odds, and with little success till 1572, when the Sea Beggars gained a foothold at Briel. From 1572 he was stadtholder of Holland and Zealand, and later of other provinces. His wisdom directed the war against the Spanish armies, led

William of Nassau.

successively by Alexi, Requesens, Don John of Austria, and Alexander Farnese, and secured independence through the Union of Utrecht 1579. From 1580 a price was on his head; his life was repeatedly attempted, and at last taken by an assassin. He was a far-seeing statesman, tolerant beyond his age, unselfish, pure, noble, the Father of his Country in the fullest sense. His services to humanity were almost unparalleled: the only names that stand beside his in the roll of liberators are Washington, Judas Maccabæus, and in less degree Timoleon.

William of Newbury, 1135–1200. English chronicler. His *Work*, pub. 1856, extends 1066–1198.

William of Orange. See WILLIAM OF NASSAU.

William of Poitiers, 11th cent. Historian of William the Conqueror.

William of Tyre. Abp. of Tyre 1175; historian of the Crusades 1127–83. His book, pub. 1549, has merit and value.

William of Wykeham, 1324–1404. Bp. of Winchester 1367; Lord Chancellor 1367–71 and 1389–91; founder of New College, Oxford, and of Winchester College 1373; eminent also as an architect and the rebuilder of Winchester Cathedral.

Williams, ALPHEUS STARKEY, 1810–1878. Brig.-gen. U. S. Vols. 1861–66; division and corps commander in Va., Tenn., and Ga.; Minister to San Salvador 1866–69; M.C. from Mich. from 1875.

Williams, BARNEY (BERNARD FLAHERTY), 1823–1876. Irish-American comedian and manager.

Williams, BENJAMIN, 1754–1814. Revolutionary officer; M.C. 1793–95; Gov. of N. C. 1799–1802 and 1807–8.

Williams, DAVID, 1754–1831. Captor, with J. Paulding and I. Van Wert, of André 1780.

Williams, DAVID ROGERSON, 1776–1830. M.C. 1805–9 and 1811–13; Brig.-gen. U. S. A. 1813–14; Gov. of S. C. 1814–16.

Williams, EDWARD, 1745–1826. Welsh poet and literary antiquarian; ed. *Myvyrian Archæology*, 1801–7.

Williams, EDWARD P., U.S.N., 1833–1870. Commander 1866; drowned off Yokohama with 22 officers and 115 men, when the *Oneida* was sunk by a British vessel.

Williams, ELEAZER, ab.1787–1858. Missionary to Indians in N. Y. and Wis.; of mixed blood; supposed by some (as in J. H. Hanson's *Lost Prince*, 1854) to be Louis XVI.'s son.

Williams, ELISHA, 1694–1755. Pres. of Yale 1726–39.

Williams, ELKANAH, M.D., 1822–1888. Prof. in Ohio; ophthalmologist.

Williams, EPHRAIM, 1715–1755. Col. of Mass. troops 1755; slain near Lake George, N. Y.; founder, by will, of a school which became Williams College.

Williams, GEORGE HENRY, b. 1823. Iowa judge 1847–52; Chief-justice of Oregon 1853–57; U. S. Senator 1865–71; Attorney-gen. 1872–75.

Williams, GEORGE HUNTINGTON, 1856–1894. Prof. Johns Hopkins from 1885; eminent as a student of petrology and inorganic geology; author of papers on the geology of Maryland. *Crystallography*, 1890.

Williams, HENRY SHALER, b.1847. Prof. of Paleontology at Cornell 1879, and at Yale since 1892; paleontologist to U. S. Geological Survey; largely occupied with Devonian geology.

Williams, HENRY WILLARD, M.D., 1821–1895. Prof. of Ophthalmology at Harvard from 1871. *Diseases of the Eye*, 1862–86.

Williams, ISAAC, 1802–1865. Contributor to *Tracts for the Times* (80, 86, 87) and to *Lyra Apostolica;* author or translator of many hymns and sacred poems. *Harmony and Commentary on the Gospel Narrative*, 8 vols., 1842–45; *The Psalms interpreted of Christ*, 3 vols., 1864–65; *Autobiography*, 1892.

Williams, JAMES, 1740–1780. S. C. officer, killed at King's Mountain.

Williams, JAMES DOUGLAS ("BLUE JEANS"), 1808–1880. M.C. 1875–76; Gov. of Indiana from 1877.

Williams, JAMES WILLIAM, D.D., 1825–1892. Anglican Bp. of Quebec 1863.

Williams, JARED WARNER, 1796–1864. M.C. from N. H. 1837–41; Gov. of N. H. 1847–49; U. S. Senator 1853–55.

Williams, JESSE LYNCH, 1807–1886. Chief engineer of Indiana 1837–53; connected with various railways and canals; director Union Pacific R. R. 1864–69.

Williams, JOHN, D.D., 1582–1650. Bp. of Lincoln 1621; keeper of the Great Seal 1621–26; fined £18,000 for opposing Laud, and imprisoned 1636–40, as again 1642–43 with other prelates; Abp. of York 1641; moderate royalist, hating and protesting against tyranny, though earnestly loyal to Charles I.

Williams, JOHN, 1664–1729. Pastor at Deerfield, Mass., from 1688; sufferer by the Indian massacre there Feb. 28, 1704, nearly all his family being killed or captured; prisoner in Canada till 1706. *Redeemed Captive*, 1707.—A daughter remained with the Indians, and became a supposed ancestress of Eleazer, the "dauphin".—A son, STEPHEN, D.D., 1693–1782, ransomed 1705, was pastor at Longmeadow, Mass., from 1716, chaplain to expeditions 1745 and 1755–56, and a founder of the Indian mission at Stockbridge.

Williams, JOHN, 1726–1798. Welsh writer on prehistoric America. *Concordance*, 1767.

Williams, JOHN ("ANTHONY PASQUIN"), ab.1765–1818. Anglo-American playwright and journalist, fined in Ireland 1797.

Williams, JOHN, 1778–1837. Col. U.S.A. 1812–15; U. S. Senator from Tenn. 1815–23.—Of his brothers, ROBERT, 1773–ab.1820, was M.C. from N. C. 1797–1803; LEWIS, 1786–1842, was M.C. 1815–42 and "father of the House"; THOMAS LANIER, 1786–1856, was Chancellor of Tenn. 1836–52.

Williams, JOHN, 1792–1858. British divine. *Alexander*, 1829; *Gomer*, 1854.

Williams, JOHN, 1796–1839. English Congregationalist, missionary in Polynesia 1816; murdered by natives of New Hebrides. His *Narrative*, 1837, was widely read.

Williams, JOHN, D.D., LL.D., b.1817. Pres. Trinity Coll. 1848–53; assistant Bp. of Conn. 1851, Bp. 1865; founder and dean of Berkeley Divinity School, Middletown, Conn., 1854. *English Reformation*, 1881.

Williams, JOHN FOSTER, 1743–1814. Mass. sea captain, active against the British 1779–80; prisoner 1780–83.

Williams, JOHN H., 1836–1896. Humorist of Norristown, Pa., *Herald* from 1871. His paragraphs were widely copied.

Williams, JOHN JOSEPH, D.D., b.1822. R. C. Bp. of Boston 1866, Abp. 1875.

Williams, JOHN STUART, b.1820. Brig.-gen. C.S.A. 1862–65; U. S. Senator from Ky. 1879–85.

Williams, JONATHAN, U.S.A., 1750–1815. Lieut.-col. and Supt. of West Point 1802–3 and 1805–12; Col. and chief engineer 1808; constructor of forts about New York.

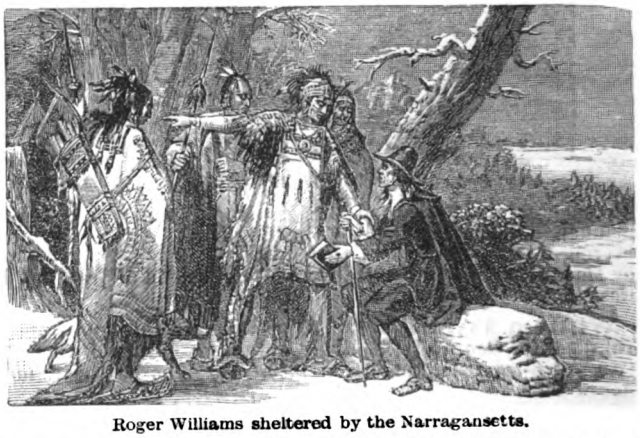
Williams, SIR MONIER, b.1819. Prof. of Sanskrit at Haileybury 1844–58, and Oxford 1860; knighted 1887: writer on Indian topics; ed. *Sákuntalá* 1853; author of Sanskrit lexicons and grammars.

Williams, OTHO HOLLAND, 1749–1794. Col. 6th Md. 1776, Brig.-gen. 1782, serving chiefly in S. C.; collector of Baltimore from 1783.

Williams, REUEL, LL.D., 1783–1862. U. S. Senator from Me. 1837–43.—His nephew, SETH, U.S.A., 1822–1866, was Brig.-gen. U. S. Vols. 1861–65, and chiefly on staff duty in Va.

Williams, ROBERT. Settler at Roxbury, Mass., ab.1638; ancestor of most of the name in New England, and many elsewhere.

Williams, ROGER, 1607–1683. British separatist, minister at Plymouth, Mass., 1631, and Salem 1633. In constant conflict with the authorities, who found him a sore spot in the body politic; he escaped being sent across sea by flight Jan. 1636, and in June settled at Providence, R. I., founding a colony on a democratic and tolerant basis. In 1639 he adopted Baptist



Roger Williams sheltered by the Narragansetts.

principles and practices. He procured a charter in England 1643, was there again 1651–54, and was Pres. of R. I. 1654–58. He was in advance of his age in relegating theologic strife from deeds to mere words: his *Bloudy Tenent of Persecution*, 1644, *Hireling Ministry*, 1652, and *George Fox digged out of his Burrowes*, 1676, were in the spirit of his time, and provoked acrid replies. *Letters*, 1863. *Works*, 6 vols., 1866–75.

Williams, ROWLAND, D.D., 1817–1870. Prof. Lampeter, Wales, 1850; contributor to *Essays and Reviews* 1860; tried for heresy 1862. *Rational Godliness*, 1855.

Williams, SAMUEL, LL.D., 1743–1817. Grandson of John of Deerfield; prof. Harvard 1780–88; astronomer and surveyor. *Hist. Vt.*, 1794.—His son, CHARLES KILBOURNE, LL.D., 1782–1853, was judge of Vt. Supreme Court 1829–42, Chief-justice and Chancellor 1842–46, and Gov. 1850–52. — His cousin, STEPHEN WEST, M.D., 1790–1855, wrote on botany and genealogy.

Williams, SAMUEL WELLS, LL.D., 1812–1884. B. in N. Y.; long in China; prof. Yale 1877; eminent as a sinologist. His *Middle Kingdom*, 1848–83, is highly valued. *Chinese Commercial Guide*, 1844–63; *Syllabic Dictionary of Chinese*, 1874.

Williams, THOMAS, U.S.A., 1815–1862. Brig.-gen. U. S. Vols. 1861; killed at Baton Rouge, La.

Williams, THOMAS HILL, 1780–1840. U. S. Senator from Miss. 1817–29.

Williams, THOMAS SCOTT, 1777–1861. M.C. 1817–19; judge Conn. Supreme Court 1829, Chief-justice 1834–47.

Williams, WILLIAM, 1717–1791. Welsh evangelist and hymnist. His English hymns, 1759–72, were reprinted 1859. Our text of "Guide me, O thou great Jehovah," is believed to be partly his.

Williams, WILLIAM, 1731–1811. Nephew of Elisha; town-clerk of Lebanon, Conn., 1756–1801; in Conn. Assembly over 50 years; in Congress 1776–77; signer of the Declaration of Independence; son-in-law of Gov. Trumbull; Councilor 1780–1804.

Williams, SIR WILLIAM FENWICK, D.C.L., 1800–1883. British general, b. in Nova Scotia; commissioner with Turkish army in the East 1854; defender of Kars 1855; Major-gen. and Baronet; M.P. 1856–59; commander in Canada 1859–65; Gov. of Gibraltar 1870–76.

Williamsburg. Capital of James City co., and of Va. till 1779; 50 m. s.e. of Richmond; founded 1632; seat of William and Mary Coll., and of a lunatic asylum opened 1773; site of an indecisive battle May 5, 1862; occupied by Union forces May 6.

Williams College. At Williamstown, Mass.; outgrowth of a free school, chartered 1793; endowed with 4 townships in Me. It has (1897) 21 professors, 7 assistants, 385 students, and a library of 40,000 vols.; its productive funds amount to $850,000. The first foreign missionary society in the U. S. was formed here 1806. It is nonsectarian. See WILLIAMS, EPHRAIM.

Williamson, ALEXANDER WILLIAM, LL.D., F.R.S., b.1824. Prof. of Chemistry at Univ. Coll., London, 1849–87. His work has been chiefly in organic chemistry.

Williamson, HUGH, M.D., 1735–1819. Prof. Phila. Coll. 1760–63; in Congress from N. C. 1784–86; M.C. 1789–93; in New York from 1793; writer on canals, comets, and climate. *Hist. N. C.*, 1812.

Williamson, ISAAC HALSTED, 1769–1844. Gov. and Chancellor of N. J. 1817–30.—His son, BENJAMIN, 1811–1892, eminent as a constitutional and corporation lawyer, was Chancellor 1852–60.

Williamson, ISAIAH VANSANT, 1803–1889. American philanthropist, who in 1888 gave $2,500,000 for a free school of mechanical trades at Media, Pa. At his death he willed $5,000,000 to the Protestant charitable institutions of Philadelphia.

Williamson, JAMES ALEXANDER, b.1829. Brigade commander in Miss. and Ga. 1863–65; Brig.-gen. U. S. Vols. 1865.

Williamson, ROBERT STOCKTON, U.S.A., 1824–1882. Engineer officer in Va. and Cal. *Use of the Barometer*, 1868.

Williamson, WILLIAM CRAWFURD, 1816–1895. English palæobotanist, who demonstrated the existence of exogenous structure in some of the palæozoic cryptogams, as *Calamites* and *Lepidodendron*.

Williamson, WILLIAM DURKEE, 1779–1846. Historian of Me. 1832–39.

Williamson's Blue. $Fe_7(CN)_{18}$. Obtained, mixed with soluble Prussian blue, by adding a solution of a ferric salt to one of potassium ferrocyanide, or by oxidizing Turnbull's blue with nitric acid or chlorine water.

Williamsport. Capital of Lycoming co., Pa., on the w. branch of the Susquehanna. Its chief industry is in lumber; its boom holds 300,000,000 ft. Pop., 1890, 27,132.

William the Lyon, 1143–1214. King of Scotland 1165–1214. He was the grandson of David I., whose policy he followed, but with less success.

William the Silent. See WILLIAM OF NASSAU.

Willibrod, or **Wilbrord,** ST., ab.658–739. Northumbrian missionary to Friesland ab.690; Bp. of Utrecht 696; active and successful evangelist. His day is Nov. 6.

Willich, AUGUST, 1810–1878. Prussian captain 1841; Brig.-gen. U. S. Vols. 1862–66, serving in Tenn. and under Sherman.

Willing, THOMAS, 1731–1821. Judge Pa. Supreme Court 1767–74; in Congress 1775–76; opponent of the Declaration; Pres. Bank of N. America 1781–91, and of U. S. Bank 1791.

Willis, NATHANIEL PARKER, 1806–1867. American poet and descriptive writer, highly popular in his day; ed. *Home Journal* from 1846. *Prose Works*, 13 vols., 1849–50; *Poems*, 1868.

Willis, THOMAS, F.R.S., 1621–1675. Prof. Oxford; royal physician 1666; writer on the nerves and the plague. *Works* (Latin), 1676, tr. 1679.

Willis, WILLIAM, LL.D., 1794–1870. Historian of Portland, Me., 1831–65, and of Me. law 1863.

Williways. Short descending gusts of wind on land, similar to cat's-paws at sea. Those observed by the French expedition to Cape Horn 1882 were more severe than any hitherto recorded in the n. hemisphere.

Willmore, JAMES TIBBITS, 1800–1863. English engraver.

Will of God. In Ethics, religious sanction to the moral law, and source of our moral obligations.

Will-o'-the-Wisp. See IGNIS FATUUS.

Willoughby, SIR HUGH, d. 1554. English explorer, who perished with his companions in Lapland. R. Chancellor, with another vessel, reached the White Sea and opened Russia to British commerce.

Willow. Trees and shrubs of the genus *Salix*, natural family *Salicaceæ*, bearing flowers in catkins, and a bitter bark; of wide geographical distribution. Several species contain in their bark a crystallizable substance salicin, used in medicine as a febrifuge.

White Willow (*Salix alba*):
a, branchlet of male tree with flowers; *b*, branchlet of female tree.

Willow-Herb. See FIREWEED.

Willow Saw-Fly (CIMBEX AMERICANA). The adult, when in flight, resembles a bee; it girdles twigs of willow and other trees to feed on the sap, and deposits its eggs on the leaves, which serve as food for the larvæ, thus defoliating the tree. The larva, when full grown, is 2 in. long, of a yellowish white color, with a dark stripe along its back. It spends the winter in the ground. As a remedy the affected trees are sprayed with arsenites.

Wills, WILLIAM GORMAN, 1830–1891. Irish playwright and novelist. *Notice to Quit*, 1861; *Nell Gwynne*, 1878; *Black-Eyed Susan*, 1880; *Royal Divorce*, 1891.

Wills, WILLIAM JOHN, 1834–1861. English explorer in Australia, which he traversed from s. to n. with O. Burke. Both perished on the way back. *Exploration*, 1863.

Willson, FORCEYTHE, 1837–1867. American poet.

Willughby, FRANCIS, 1635–1672. English ornithologist and ichthyologist, pupil and co-worker with John Ray; precursor of Linnæus. *Ornithologia*, 1678; *Historia Piscium*, 1686.

Wilmarth, SETH, 1810–1886. Supt. Charlestown, Mass., Navy Yard 1855–75; inventor of improvements in monitors.

Wilmer, RICHARD HOOKER, D.D., LL.D., b.1816. Bp. of Ala. 1864; suspended by Gen. Thomas, 1865.—His cousin, JOSEPH PERE BELL, D.D., 1812–1878, became Bp. of La. 1866.

Wilmington. Capital of Newcastle co., and largest city in Del.; founded 1731, on the site of a Swedish fort built 1638; chartered 1832. It has excellent railroad communications and some navigation. Its manufactures are varied. The old Swedes' Ch. dates from 1698. Pop., 1890, 61,431.

Wilmington. Capital of New Hanover co., N. C., on Cape Fear River, here navigable 30 m. from the ocean; settled 1730, chartered 1739 and 1866. Pop., 1890, 20,056.

Wilmot, DAVID, 1814–1868. M.C. 1845–51; author of the WILMOT PROVISO (q.v.); Pa. Judge 1853–61; U. S. Senator 1861–63; U. S. Judge from 1863.

Wilmot, JOHN. See ROCHESTER.

Wilmot, LEMUEL ALLAN, D.C.L., 1809–1878. Premier of New Brunswick 1848; Judge Supreme Court 1851–68; Gov. 1868–73.—His cousin, ROBERT DUNCAN, b.1809, was Canadian Senator 1865–80, Speaker and Privy Councilor 1878–80.

Wilmot Proviso. Amendment, Aug. 8, 1846, to a bill for the purchase of Mexican territory, providing that "neither slavery nor involuntary servitude shall exist in any part of said territory." It passed the House, but not the Senate. In 1848 its Democratic adherents, with the Liberty party and the anti-slavery Whigs, united to form the Free Soil party.

Wilna. See VILNA.

Wilson, ALEXANDER, 1766–1813. Scottish-American weaver, peddler, and poet, who under heavy difficulties brought out his fine and valuable *American Ornithology*, 7 vols., 1808–13. Two more were pub. by G. Ord, and a supplement of four by C. L. Bonaparte, 1828–33.

Wilson, ALLEN BENJAMIN, 1824–1888. Cabinet-maker of Mass.; inventor of a sewing-machine, patented 1850–52; partner of N. WHEELER (q.v.) from 1851.

Wilson, SIR ARCHDALE, 1803–1874. English officer, distinguished in the capture of Delhi and Lucknow 1857–58; Baronet and Major-gen. 1857.

Wilson, AUGUSTA E. See EVANS, AUGUSTA.

Wilson, SIR CHARLES RIVERS, b.1831. Anglo-Indian financier; pres. Canadian Grand Trunk Railway 1895.

Wilson, SIR DANIEL, LL.D., 1816–1892. Prof. Univ. Toronto from 1853, pres. 1881; scientist and poet; knighted 1888. *Old Edinburgh*, 1847–78; *Archæology of Scotland*, 1851–63; *Prehistoric Man*, 1862; *Anthropology*, 1885.—His brother, GEORGE, M.D., 1818–1859, prof. Edinburgh 1855, pub. *Chemistry*, 1850, and *Five Gateways of Knowledge*, 1856.

Wilson, EPHRAIM KING, 1821–1896. M.C. from Md. 1873–75; Judge 1878–84; U. S. Senator 1885–95.

Wilson, SIR ERASMUS, LL.D., F.R.S., 1809–1884. Scottish surgeon and philanthropist, knighted 1881; writer on anatomy and on Egypt.

Wilson, FLORENCE, ab.1500–1547. Scottish humanist, known only by his Latinized name, Florentius Volusenus. His chief work, *De Animi Tranquillitate*, 1543, is written in the purest classical Latin.

Wilson, GEORGE FRANCIS, 1818–1883. Manufacturer of chemicals at Providence, R. I., with Eben N. Hosford, from 1855; inventor of several mechanical devices.

Wilson, HENRY (orig. J. J. COLBAITH), 1812–1875. Shoemaker of Natick, Mass.; anti-slavery leader; pres. Mass. Senate 1850; U. S. Senator 1855–73; chairman committee on military affairs 1861–65; Vice-pres. 1873. *Rise and Fall of the Slave Power*, 1872–75.

Wilson, HENRY BRISTOW, 1803–1888. Prof. Oxford; contributor to *Essays and Reviews*, 1860, and to *Oxford Essays*; tried for heresy 1862. *Communion of Saints*, 1851.

Wilson, HORACE HAYMAN, F R.S., 1786–1860. Anglo-Indian official 1808–32; prof. Oxford from 1833, and librarian at E. India House from 1836; translator of many Sanskrit works; author of a Sanskrit dictionary, 1819, and grammar, 1841. *Hist. British India, 1805–35*, 1844–48.

Wilson, JAMES, LL.D., 1742–1798. B. in Scotland; in Pa. from 1766; in Congress 1775–77, 1783, and 1785–88; signer of the Declaration of Independence; framer and defender of the Constitution; Justice U. S. Supreme Court from 1789; law prof. Phila. Coll. 1790. *Works*, 1803–4.—His son, BIRD, D.D., LL.D., 1777–1859, was prof. P.E. Theol. Sem. New York 1821–50. *Life of Bp. White*, 1839.

Wilson, JAMES, 1805–1860. M.P. 1847; founder *Economist* 1843; writer on currency and the corn-laws.

Wilson, JAMES F., 1828–1895. M.C. from Iowa 1861–69; U.S. Senator 1883–95.

Wilson, JAMES GRANT, LL.D., b. 1832. Col. U. S. Vols. 1863–65; aid to Gen. Banks in La.; since in New York; biographer of Gen. Grant 1868, F. G. Halleck 1869, and others; ed. *Cyc. American Biography*, 1886–89.—His father, WILLIAM, 1801–1860, Scottish poet, was a bookseller at Poughkeepsie, N. Y., from 1834.

Wilson, JAMES HARRISON, b. 1837 in Ill. Brig.-gen. U. S. Vols. 1863, serving chiefly in Tenn.; Major-gen. 1865–66; Lieut.-col. U. S. A. 1865–70; since engaged in railroad work. *China*, 1887.

Wilson, JOHN, 1588–1667. Pastor at Boston, Mass., from 1630.

Wilson, JOHN ("CHRISTOPHER NORTH"), 1785–1854. Prof. Edinburgh 1820; essayist and poet. *Sights and Shadows of Scottish Life*, 1822; *Noctes Ambrosianæ*, 1822–35.

Wilson, JOHN, 1802–1868. Scottish printer and polemic, in Boston and Cambridge, Mass., from 1846. *Punctuation*, 1826–50; *Unitarianism*, 1833–47.

Wilson, JOHN, D.D., F.R.S., 1804–1875. Scottish missionary at Bombay from 1828. *Parsi Religion*, 1843; *Lands of the Bible*, 1847.

Wilson, JOHN ALLSTON, b.1837 in Pa. Civil engineer, engaged chiefly on railways.—His brother, JOSEPH MILLER, b. 1838, has planned many bridges and buildings.

Wilson, JOHN LEIGHTON, D.D., 1809–1886. American missionary in Africa 1834–52; ed. *Foreign Record*, 1853–61, and *Missionary*, 1861–85; *Western Africa*, 1857.

Wilson, JOHN LYDE, 1784–1849. Gov. of S. C. 1822–24; Nullifier and duelist.

Wilson, JOHN MACKAY, 1804–1835. Scottish writer. *Tales of the Borders*, 1834–40.

Wilson, PETER, 1746–1825. Prof. Columbia 1789–92 and 1797–1820; ed. Sallust and Longinus. *Prosody*, 1810–17.

Wilson, RICHARD, 1714–1782. British landscape painter. At first he painted portraits, but Zuccarelli and Vernet strongly recommended him to paint landscapes after seeing some of his works. In color, composition and aerial truth, none have excelled and few equaled him. It is only in lack of material he falls below the level of Claude.

The Morning, by Richard Wilson.

Wilson, SIR ROBERT THOMAS, 1777–1849. English general and military writer; M.P. 1818–31. *Diary*, 1861.

Wilson, THEODORE DELAVAN, 1840–1896. U. S. naval constructor 1873. *Shipbuilding*, 1873.

Wilson, THOMAS, 1524–1581. English divine, in exile 1553–58; sec. to Queen Elizabeth 1558; Sec. of State 1577; Dean of Durham 1579. *Logique*, 1551; *Rhetorique*, 1553; *Usurie*, 1572.

Wilson, THOMAS, D.D., LL.D., 1663–1755. Bp. of Sodor and Man 1698; eminent for saintly character and administrative reforms. His *Sacra Privata* and other devotional books have been very popular. *Works*, 1781.

Wilson, WILLIAM DEXTER, D.D., LL.D., b.1816. Prof. Geneva (Hobart) Coll. 1850, Cornell 1868–86. *Logic*, 1856–72; *Psychology*, 1871; *Metaphysics*, 1872–77.

Wilson, WILLIAM LYNE, LL D., b.1843. Prof. Columbian Coll., D. C., 1865–71; pres. Univ. W. Va. 1882–83; M.C. 1883–95; chief framer of the tariff of 1894; U. S. Postmaster.-gen. 1895–97; pres. Washington and Lee Univ. 1897.

Wilson, WOODROW, LL.D., b.1856 in Va. Prof. Bryn Mawr, Pa., 1886, Wesleyan Univ. 1888, and Princeton since 1890. *Congressional Government*, 1885; *The State*, 1889; *Division and Reunion*, 1893; *Essays*, 1894; *Washington*, 1897.

Wilson's Creek. In Mo.; scene of a Confederate victory Aug. 10, 1861. Gen. Lyon, Union commander, was killed.

Wilson's Petrel. See PETRELS.

Wilson's Specific Gravity Bulbs. Small hollow glass balls with a short stem. To determine the specific gravity of a liquid by their means, it is only necessary to note which one of a series of these balls will just float when immersed in the liquid. In the preliminary graduation they may be assorted by trial in liquids of known specific gravity; any small adjustment is accomplished by grinding the stem. They are very delicate and are said to show a difference in the third place of decimals in the specific gravity of a liquid.

Wilson's Thrush, or VEERY (TURDUS FUSCESCENS). Song thrush common in the e. U. S. It is very shy, frequents thick woods and swamps; tawny brown above, below whitish, with a few small spots on its throat.

Wilstach, JOHN AUGUSTINE, b.1824 in Washington. Tr. of Virgil 1884, and Dante 1888.

Wilton, JOSEPH, 1722–1803. English sculptor.

Wilton Carpet. Brussel carpets with the yarn cut, which gives the face an elastic velvety pile.

Wimble. Auger used by miners in boring in soft rocks.

Wimbledon. S.w. suburb of London; scene of rifle meetings 1860–89. Pop., 1891, 25,758.

Wimmer, BONIFACE, 1809–1887. Bavarian priest, in Pa. from 1846; founder of St. Vincent's Abbey, Beatty, West-

moreland co., Pa., 1848–52, and of several branches; abbot and pres. 1866.

Wimmer, FRIEDRICH, 1803–1868. German botanist. *Flora Silesiæ* (with H. Grabowsky), 1827–29; *Flora von Schlesien*, 1832–57; *Das Pflanzenreich*, 1853–63.

Wimpffen, EMMANUEL FÉLIX DE, 1811–1884. French general 1855; Gov. of Algeria; prominent in 1871. *Sédan*, 1871; *La Nation Armée*, 1876.

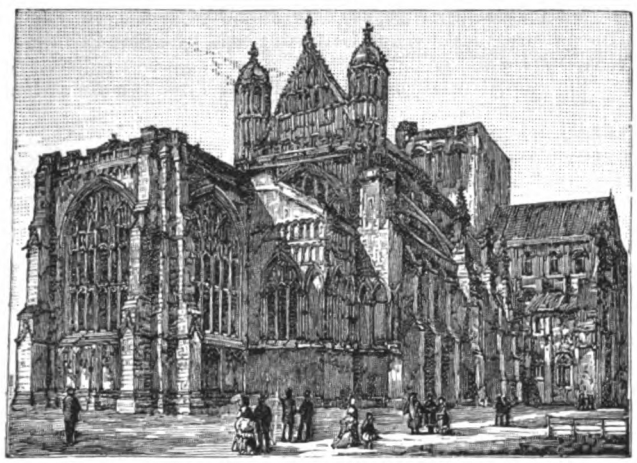
Wimpffen-Berneburg, ALEXANDER STANISLAUS, 1748–1819. French traveler in W. Indies. *St. Domingo*, tr. 1797.

Winans, ROSS, 1796–1877. Founder of machine-shops in Baltimore; improver of car wheels and locomotives.

Winchell, ALEXANDER, LL.D., 1824–1891. Prof. Univ. Mich. 1854–73, and from 1879; director geological survey of Mich. 1859–61 and 1869–71; Chancellor Syracuse Univ. 1872–74. His chief works are *Sketches of Creation*, 1870; *Evolution*, 1874; *Preadamites*, 1880; *Sparks from a Geologist's Hammer*, 1881; *World Life*, 1883; *Geological Studies*, 1886.—His brother, NEWTON HORACE, b.1839, prof. Univ. Minn., has been engaged in geological surveys of Mich., Ohio, and since 1872 of Minn. His work is chiefly among the older palæozoic rocks.

Winchelsea, ANNE FINCH, COUNTESS OF, d.1720. English poet.

Winchester. Ancient city of Hampshire, on the Itchen, 60 m. w.s.w. of London; once capital of England; seat of a



Winchester Cathedral.

bishop, and of a college founded 1369–93. Its cathedral was built 1079–93. Pop., 1891, 19,073.

Winchester. Capital of Frederick co., Va.; in the Shenandoah valley, 87 m. w.n.w. of Washington; scene of Confederate successes under Gen. Ewell May 25, 1862, and June 14, 1863, and of a Union victory under Sheridan Sept. 19, 1864. Pop., 1890, 5,196.

Winchester, ELHANAN, 1751–1797. Founder of a Universalist society in Phila. 1781; active propagandist in New England from 1787; voluminous writer in prose and verse.

Winchester, JAMES, 1752–1826. Brig.-gen. U.S.A. 1812. His troops were surrendered and mostly massacred on Raisin River, Mich., Jan. 22, 1813.

Winchester, OLIVER FISHER, 1810–1880. Manufacturer of repeating rifles at New Haven, Conn., from 1860.

Winchester, WILLIAM PAULET, MARQUIS OF, ab.1477–1572. Courtier under the Tudors; Baron 1537, Earl 1550, Marquis 1551; Treasurer from 1549; richest subject of his time.

Winchester Rifle. Repeating arm, of which the best known form is the model of 1873. It has a tubular magazine under the barrel, which contains from 15 to 25 cartridges, depending on the length and caliber of the gun. The cartridges in the magazine are pressed to the rear by a spiral spring. To load the gun, press forward the lever which forms the trigger guard; this motion throws the empty shell out of the chamber, raises a cartridge from the magazine to the front of the chamber and cocks the hammer; when the lever is returned to its first position it forces the cartridge into the chamber and closes the breech, leaving the mechanism in the firing position. The model of 1895 has a box magazine with five cartridges. The forward motion of the lever withdraws the trigger from contact with the sear, draws down a locking bolt, and withdraws the breech bolt, at the same time cocking the gun and ejecting the empty cartridge from the chamber. The breech bolt, in passing to the rear, locks the firing pin, and the hammer, resting against the bolt, holds the latter open. When the lever is restored to its first position, the breech bolt is moved forward, pushing the cartridge into the chamber, and, when the breech bolt reaches its closed position, the locking bolt comes into place, locking the breech bolt and unlocking the firing pin. The final movement of the lever brings the trigger into bearing against the sear, and the gun is in the firing position.

Winckelmann, JOHANN JOACHIM, 1717–1768. German art critic of high rank, librarian at Dresden and Rome. His *History of Ancient Art*, 1764, is of historical importance. *Works*, 8 vols., 1808–20.

Winckler, JOHN JOSEPH, 1670–1722. German hymnist.

Wind. See WINDS.

Winder, WILLIAM HENRY, 1775–1824. Col. U.S.A. 1812, Brig.-gen. 1813–15; defeated at Bladensburg, Md., 1814.—His son, JOHN HENRY, 1800–1865, Brig.-gen. C.S.A., had command of Libby prison, Richmond, and Andersonville, Ga.

Windermere. Lake between Lancashire and Westmoreland, noted for beauty; celebrated by Wordsworth. Length 11 m., greatest width 1 m.

Wind-Flower. Showy-flowered herbs of the genus *Anemone*, natural family *Ranunculaceæ*, of wide geographical distribution. Some are cultivated for ornament.

Windgall. Puffy swelling around the fetlock-joints of animals, especially horses. It is due to an increased secretion of synovia arising from work on hard roads. They do not produce pain or lameness. Old horses are worked, young horses are blistered and not worked.

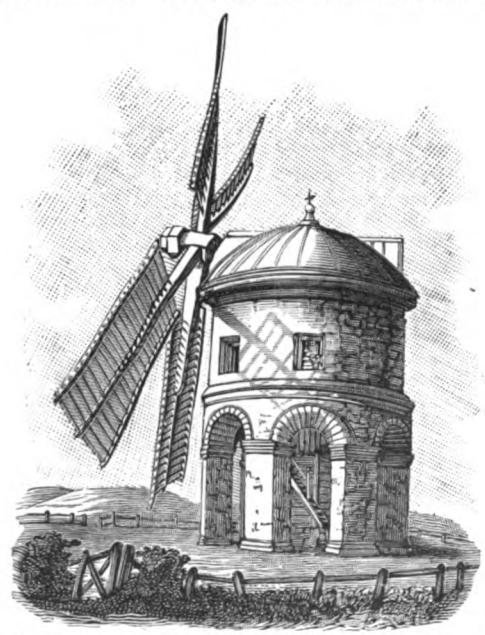
Windham, WILLIAM, 1750–1810. M.P. 1784; Sec. of War 1794–1801 and 1806–7; eminent orator; called "Weathercock." *Speeches*, 1806; *Diary*, 1866.

Windisch, ERNST, b.1844. Prof. Sanskrit at Heidelberg 1872, Strasburg 1875, and Leipzig since 1877; writer on comparative philology.

Windischgrätz, ALFRED, PRINCE VON, 1787–1862. Austrian general, Gov. of Prague 1826–49, Field-marshal 1833. He suppressed insurrections at Prague and Vienna, but was inefficient in Hungary.

Windlass. Modified form of the wheel and axle used to raise great weights. It differs from the CAPSTAN (q.v.) principally in the horizontality of its axis.

Windmills. Motors for utilizing the pressure of wind in motion. The historic types had four radial arms, borne upon a horizontal axis which was supported in a revolving cap at the top of a tower. The sails were of canvas, and could be



Windmill at Chesterton, Warwickshire, by Inigo Jones.

unfurled upon a light framework. The modern mill uses wooden slats, filling the entire annular area of their circle, and mounted upon a frame to the plane of which each slat is inclined at the angle of best efficiency, which varies from

48° to 82°, as the linear velocity of the elements of the sails increases relatively to that of the wind. The revolving frame is secured to a horizontal bed-casting, which is automatically brought so that the frame will be perpendicular to the direction of the wind by a large rudder, which projects horizontally at right angles to the plane of the frame. The slats or sails are also made automatically to furl, when the pressure exceeds a certain limit upon the resisting area, in two ways. They are held in their normal position by a spring, adjusted to a certain wind-pressure, or by a governor set to a certain velocity of rotation. When either is exceeded by high velocity of wind, the slats either turn edgewise individually, or the rudder is tripped so as to come into the plane of the wheel, when the latter turns bodily edgewise, or the slats are swung around short axes at right angles to their length, so that they form elements of an acute angled cone. Windmills of these types are much used for pumping, or for any other purposes where power can be stored up to supply intermittent demands upon it. Near the seacoast windmills can be worked from $\frac{1}{2}$ to $\frac{3}{4}$ of the time; inland, they work more than this in winter, and less in summer.

Windom, WILLIAM, 1827–1891. M.C. from Minn. 1859–69: U. S. Senator 1870–81 and 1881–83; Sec. of the Treas. 1881 and from 1889.

Window. Aperture in a wall for the admission of air and light. They were almost unknown in the religious structures of the Egyptians, Greeks, and Romans, but are a distinctive feature of the Gothic. In Classical architecture they are rectangular openings, ornamented exteriorly like doorways, sometimes arched; circular and semicircular forms are sometimes used. In Saxon architecture they are small and are splayed externally and internally. In church towers there are two or more lights, separated by pillars and having semicircular or triangular arches. In the Norman style the windows are small, but later of considerable size, arched, with a small shaft on each side and a molding over the arch; they are also divided by shafts into two or more lights. Circular windows are also found. In Early English they are long and narrow, singly or in groups, under a large arch. On the inside are small shafts, and much ornamentation with moldings. Circular and triangular windows are also found. In Decorated style windows are larger and divided by mullions into separate lights, and with tracery in the heads. They have two-centered pointed arches, also segmental and square heads. The ball-flower molding is much used. In the Perpendicular style transoms are used, and heads, formed of four-centered arches. Circles and quartrefoils and small battlements are often used. Later the heads became flatter, until the arch ceased to be used, and the opening was divided into rectangular lights. The low-side or lepers' window or Lychnoscope, in churches prior to the Early English, is thought to have been used to administer the Sacrament to lepers, or that the altar light might be seen from outside. The Rose window of the Middle Ages was circular with radiating mullions; also called Catherine or wheel windows. Roman windows were first closed with shutters, later mica was used, and ab. 150 horn. Colored glass windows for churches are mentioned by Gregory of Tours ab. 350. Glass was used in windows of private houses in England in 1180. See DECORATED STYLE. DORMER WINDOW, LANCET WINDOW, LANTERN, ROSE WINDOW, TRACERY, etc.

Windpipe. See TRACHEA.

Wind Pressure. As usually taken in computing stresses on roofs, this is 40 lbs. per sq. ft. of vertical surface. This pressure obtains when the wind has a velocity of ab. 28 m. per hour. See PRESSURE OF THE WIND.

Wind River Mts. High rugged range of the Rocky Mt. system, in w. Wyoming. Many peaks exceed 13,000 ft. in height. It contains several small glaciers.

Wind-Rose. Classification of any meteorological phenomenon according to the prevailing wind-directions, especially the simple enumeration of the wind directions. See BARIC WIND-ROSE and THERMIC WIND-ROSE.

Winds. Sensible currents of the atmosphere, and distinct from that motion which is the consequence of the diurnal and annual movements of the earth, which is not perceptible. See ANTICYCLONE, CHINOOK WIND, CYCLONE FERREL'S LAW, FOHN WIND, HURRICANES, LAW OF STORMS, LAW OF WINDS, MISTRAL, SIROCCO, SQUALL, STORM CIRCLE, STORM TRACK, TRADE WIND, WHIRLWIND, WILLIWAYS, etc.

Winds, WILLIAM, 1727–1789. Col. N. J. troops 1776; Brig.-gen. 1777.

Wind-Sale. Laplanders and witches or old women in the Orkneys were reputed to sell favorable winds to mariners.

Wind's Eye. Point from which the wind blows.

Windship, GEORGE BARKER, M.D., 1834–1876. Mass. athlete; lecturer on physical culture, and deviser of health-lifting.

Windsor. Town of Berkshire, on the Thames, 21 m. w. of London. Its royal castle is in part old, but mainly built

Windsor Castle.

1821–28. Charles II. employed Wren to build the state apartments, and Wyatville transformed the castle under George IV. The park covers 13,000 acres. Pop., 1891, 12,327.

Windsor. Town of Ontario, on Detroit River. Pop., 1891, 10,322.

Windthorst, LUDWIG, 1812–1891. Hanoverian Minister of Justice 1862–65; prominent member of the Reichstag from 1867; leader of R. C. Center party, and strong opponent of Bismarck.

Windward, TO. Toward that quarter whence the wind blows.

Windward Islands. S.w. group of W. Indies; St. Lucia, Barbadoes, St. Vincent, and Granada; held by Great Britain.

Windy Cap. King Erick of Sweden, who was believed to order the winds by setting his cap in the direction he wished the winds to blow.

Wine, SPIRITS OF. See ALCOHOL.

Winebrennarians. German Baptist sect, founded 1830 in Pa. by John Winebrenner (1797–1860) as "Church of God," and practicing feet-washing as obligatory. It has ab. 50,000 members.

Wineland. See VINLAND.

Wine Plant. Name given to RHUBARB (q.v.).

Winer, GEORG BENEDIKT, 1789–1858. Prof. Erlangen 1823, Leipzig 1832. *Grammar of N. T. Greek*, 1822, tr. 1825; *Chaldee Grammar*, 1824, tr. 1845; *Confessions of Christendom*, 1824, tr. 1873.

Wines. Fermented juice of the grape. With the best practice in France the maturity of the grapes is determined by testing the amount of sugar in the juice by the saccharimeter. The bunches are cut from the vines by pruning-knives or small shears by women and children and carried in pails by men to large wooden tubs or to carts, in which they are transported to the cellar. Some of the best wines are made from one variety of grapes, others from mixtures of several varieties. The grapes are sorted in the field or in the cellar, poor or unripe fruit being rejected. In making red wine the grapes on the stems are crushed by a machine with two grooved cylinders and placed in the fermentation vats, or, as in the Bordeaux district, the bunches of grapes are crushed in the vats by men's feet or by pounders. The vats are of oak or chestnut, truncated cone-shaped, of 400 to 1,000 gals. capacity, and open or closed, the practice varying. The grapes are sometimes separated from the stems by a sieve, before crushing.

The wine yeast or ferment consists of several species of saccharomycetes, unicellular plants $\frac{1}{500}$ to $\frac{1}{150}$ mm. diameter, always found upon the surface of the grape. They reproduce by fissure or by budding; one cell with a favorable menstruum and temperature will produce 35,000 cells in 48 hours. The fermentation, due to oxidation of the albuminous contents of the cells, transforms the sugar of the grape juice or must into alcohol, with evolution of carbon dioxide. The temperature for fermentation is 15° C. to 25° C.; it reaches its highest point in 3 to 4 days, and is completed in the Bordeaux district in 7 to 10 days, in warmer places in 4 to 5 days. A must of 13.9° B. gravity contains 236 grains of sugar per liter and should yield 13 9 per cent alcohol in the wine. The wine is drawn from a spigot near the bottom of the vat and constitutes three-fourths of the product. The skins and lees are pressed and yield the balance, which is sometimes added to the former. Of Bordeaux or claret wines 70 to 80 per cent by weight is obtained from the grapes. The wine is now placed in casks of ab. 50 gals. capacity, kept full, and loosely stopped, for the slight after-fermentation, lasting 4 to 6 weeks. The casks are then filled and tightly closed. They are now transferred to the vaults, which should have a temperature of 10° C. to 15° C. The wine gradually becomes clearer, the impurities settling out, and in December the common qualities are racked or siphoned into other casks, leaving the sediment in the bottom.

This consists of albuminous and coloring matters, tannic acid and potassium, calcium and magnesium tartrates. With finer wines this takes place in March and again in August, and so on until it is bottled. If the wine does not clear after three rackings, it is filtered or is fined with egg-white, isinglass, or gelatin. The common wine is bottled at the end of a year, the finer wine remains in the casks 4 years or more.

White wine is made from the juice of white or colored grapes, pressed immediately after gathering and fermented without the skins or stems. The more famous white wines are made from white grapes. For the dry white wines the wine is left on the lees till May or June, when the sugar has been all converted into alcohol; in these the bouquet is at a maximum. For the sweet white wines, the fermentation is checked by burning sulphur in the casks or otherwise. The alcoholic white wines are made from grapes rich in sugar or by the addition of alcohol. Sometimes, to the skins and lees from wine, water sugar, tartaric and tannic acid are added, and another fermentation is effected, as in the first case, and second wine results.

Grape juice contains water, grape and fruit sugar, gelatin or pectin, gum, fat, wax, vegetable albumen, vegetable gluten, other extractive matters, tartaric acid, potassium bitartrate, calcium tartrate, racemic acid and malic acid, free and combined with calcium, oxides of iron and manganese, potassium sulphate, calcium phosphate, sodium chloride, magnesia, silica, and the substances which produce the vinous smell and aroma. The sugar amounts to 13 to 30 per cent in ripe grapes and yields from 7 to 15 per cent alcohol by weight.

Wine contains water, alcohol, sugar, gum, extractive and albuminous matters; free tartaric, racemic, malic, and acetic acids; potassium, calcium, and magnesium tartrates; potassium sulphate, calcium phosphate, sodium chloride; œnanthic ether and œnanthine, which impart the bouquet or aroma. The red wines contain the coloring matter and tannic acid; the white wines do not contain these last two. The properties of wine depend upon the sugar, alcohol, tartaric acid, and water, not considering taste and odor. The tannic acid is derived from the skins, stems, and stones, and the coloring matter from the skins. The percentage of alcohol in wines is, by volume, as follows: Port, 20.7 to 23.2; Madeira, 19 to 19.7; sherry, 15.4 to 24.7; champagne, 14.1 to 14.8; Burgundy, 10.1 to 13.2; Rhine wine, 9.5 to 13; claret, 9.1 to 11.1; Moselle, 8.7 to 9.4. The amount of sugar in grains per oz. is as follows: Sherry, 4 to 18; Madeira, 6 to 20; champagne, 6 to 28; Port, 16 to 34; Malmsey Madeira, 56 to 66; Tokay, 74; Cyprus, 102. The acid, calculated as tartaric acid in grains per oz., is: Sherry, 1.95 to 2.85; Port, 2.10 to 2.55; champagne, 2.40 to 3.15; claret, 2.55 to 3.45; Madeira, 2.70 to 3.60; Burgundy, 2.55 to 4.05; Rhine wine, 3.05 to 3.60; Moselle, 2.85 to 4.50. Wines become musty from mold penetrating the corks. Turning of wine is due to decomposition of the potassium bitartrate, which results finally in turning alcohol into acetic acid. Ropiness is due to formation of vegetable mucus from the sugar, influenced by tartaric acid. Bitterness, as in Burgundy wines, is due to citric ether formed by a second fermentation caused by the sediment; drawing off the wine or adding new wine may remedy it. Pasteuring or heating wine to 140° F., out of contact with the air, prevents spontaneous decomposition due to microbes and improves the aroma and flavor.

The production of wine varies from year to year and a large production does not always indicate good quality. The production in 1891 in gallons was: France, 875,685,252; Spain, 899,654,422; Jerez, 7,639,236; Italy, 923,210,640; German Empire, 13,427,184; Austria, 47,691,600; Hungary, 50,624,000; Croatia-Slavonia, 15,645,201; Portugal, 115,300,000; Douro, 7,500,000; Madeira, 887,634; United States, 23,724,890. Average annual production of Russia is 75,000,000; Greece, 39,600,000; Roumania, 53,000,000; Switzerland, 28,420,000; Turkey, with Cyprus, 65,000,000; Servia, 72,800,000; Bulgaria, 70,000,000; Argentina, 39,600,000; Chili, 39,520,000; Cape Colony, 2,642,000; Australia, 3,000,000; Tunis, 2,500,000; Persia, 739,000; Canaries, 3,950,000. The average annual production of champagne in France from 1881 to 1891 was 41,269,750 qt. bottles, of which 21,699,111 were exported. The estimated production of wine in the United States in 1897 was 35,370,000 gals.; California produced 25,000,000 gals. dry wine, 4,000,000 sweet wines; Ohio, 1,800,000 gals. wine; New York, 1,500,000; Missouri, 2,500,000; Southern States, 300,000; and other States, 270,000. There were exported 14,669 bottles, value $60,726, and 1,199,921 gals., value $517,795. There were imported still wines 2,645,932 gals, value $1,823,969, and 295,308 doz. bottles, value $1,426,620; and champagne 216,106 doz. bottles, value $3,170,024. In 1894 there were exported from U. S. in bottles 13,813 doz., value $63,800, and 802,192 gals., value $380,588, chiefly to Mexico, Germany, Hawaiian Islands, Great Britain, Central America, and West Indies; 12,312 gals. were exported to France.

See ALCOHOL, BURGUNDY WINES, CHAMPAGNE, FERMENT, FERMENTATION, MADEIRA WINES, MOSELLE WINE, MUSCATEL, PHYLLOXERA, PORT WINE, RHENISH WINE, SHERRY, TOKAY, VINE, and YEAST.

Wines, ENOCH COBB, D.D., LL.D., 1806–1879. American penologist; founder of the National Prison Association 1870; promoter of International Penitentiary Congresses at London 1872 and Stockholm 1877. *Laws of the Ancient Hebrews*, 1852; *Prisons and Child-Saving Institutions*, 1880.—His son, FREDERICK HOWARD, b.1838, has carried on his work.

Wing. 1. In Botany, thin appendage of many seeds and fruits, aiding in their distribution by the wind. 2. Narrow decurrent portion of a leaf upon the petiole or the stem of a plant. 3. One of the lateral petals of a pea-flower.

Wing, AUGUSTUS, 1809–1876. Geologist of Vt. who found Silurian fossils in its limestones.

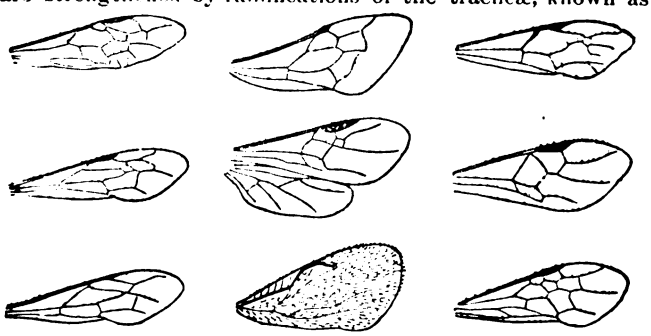
Wing, HENRY HIRAM, b.1859. Asst. director N. Y. Agricultural Experiment Station 1882–84, instructor in agriculture Univ. Neb. 1884–88, deputy director Agricultural Experiment Station Cornell Univ. 1888–94, asst. prof. animal industry and dairy husbandry Cornell Univ. since 1891. *Milk and its Products*, 1897.

Wingate, GEORGE WOOD, b.1840. Brig.-gen. N. Y. militia 1874–79; "father of rifle-practice in America." *Manual*, 1872.—His brother, CHARLES FREDERICK, b.1847, is an eminent sanitary engineer.

Wingate, PAINE, 1739–1838. U. S. Senator 1789–93; M.C. 1793–95; Judge N. H. Superior Court 1798–1809.

Wing Dam. Dam built partly across a stream to deepen the channel on the other side by the scour of the water.

Wings of Insects. Membranous expansions of the respiratory or tracheal system; hence modified branchiæ. There are usually two pairs, borne on the meso- and meta-thorax. They are strengthened by ramifications of the tracheæ, known as



Wings of Insects.

nervures, ribs or veins. The spaces inclosed between the branches of these are cellules. The ribs, beginning at anterior or external edge, are the costal, subcostal, radial, premedian, median, postmedian, cubital, and anal. The cellules take their names from the ribs behind which they lie. One or more of these ribs are absent in the wings of most insects. Authors differ in the terms used. Those here given are according to Prof. Comstock, who is developing the subject.

Wing Wall. Inclined side wall retaining the earth at the mouth of a culvert; often built with a warped surface.

Winifred, ST. Legendary British confessor, who survived decapitation; commemorated at Holywell, Flintshire.

Winkelried, ARNOLD VON. Burgher of Unterwalden, Switzerland, to whom was due the victory at Sempach July 9, 1386. He made a path with his body over the Austrian lances. His heroism is celebrated in a poem by James Montgomery.

Winkworth, CATHERINE, 1829–1878. English translator of German hymns. Her *Lyra Germanica*, 1855–58, and *Chorale Book*, 1863, are of high value; their contents are "faithful, terse, and delicate," and have been drawn upon for public use more largely than the versions of any one else. *Christian Singers of Germany*, 1869.

Winlock, JOSEPH, 1826–1875. Supt. *Nautical Almanac* 1856–59 and 1861–66; Prof. of Astronomy at Harvard from 1866; observer of solar eclipses in Ky. 1869 and Spain 1870.

Winnebagoes. Indians of Sioux descent, but not belonging to the Sioux confederacy. They joined with the Sacs, Foxes, and Pottawatomies against the Dakotas and Iroquois. They were agricultural and lived near Green Bay, Wis., but in 1848 were removed to Minn.; in 1863 most were placed on a reservation near Omaha.

Winnebago Lake. In e. Wis.; area 212 sq. m.

Winnemucca Lake. In w. Nev.; drained by Truckee River. Area 85 sq. m.

Winnipeg. Capital of the province of Manitoba, Canada; on the Red and Assiniboine Rivers; chartered 1873; previously

Winnipeg.

Ft. Garry. It has an important trade, chiefly in grain. Pop., 1891, 25,642.

Winnipeg, LAKE. In Manitoba, Can. It receives the waters of the Assiniboine and Saskatchewan Rivers, and empties into Hudson's Bay by Nelson River. Area ab. 8,700 sq. m.

Winnipeg River. In Manitoba, flowing n.w. from Lake of the Woods to Lake Winnipeg.

Winnepesaukee, or **Winnipiseogee,** LAKE. In N. H., e. of the Merrimac; noted for the beauty of its islands and irregular shores. Elevation 472 ft.; area 175 sq. m.

Winona. Capital of W. co., Minn., on the Mississippi, 103 m. s.e. of St. Paul. It has a large grain trade. Pop., 1890, 18,208.

Winooski River. In Vt.; flowing w. past Montpelier into Lake Champlain 4 m. n.w. of Burlington. It has channels through solid rocks from 30 to 100 ft. deep, and in many places natural bridges and caverns. Length 70 m.

Winslow, EDWARD, 1595–1655. One of the *Mayflower* pilgrims; Gov. of Plymouth 1633, 1636, and 1644; thrice in England, and in prison 1635. *Good Newes from New England*, 1624; *Progress of the Gospel*, 1649.—His son, JOSIAH, 1629–1680, was Gov. of Plymouth from 1673, and general of the colonies 1675.—His grandson, JOHN, 1702–1774, became Major-gen. of militia, and expelled the Acadians 1755.—His nephew, EDWARD, 1746–1815, became Gov. of New Brunswick.

Winslow, FORBES BENIGNUS, M.D., D.C.L., 1810–1874. English writer on mental disease.

Winslow, JACQUES BÉNIGNE, 1669–1760. French anatomist. *Structure du Corps humain*, 1732.

Winslow, JENS OLAUS, 1739–1794. Danish naval officer, writer on the West Indies.

Winslow, JOHN ANCRUM, U.S.N., 1811–1873. Commander of the *Kearsarge*, which sunk the *Alabama* off Cherbourg, June 19, 1864; Commodore 1864; Rear-admiral 1870.

Winslow, MIRON, D.D., LL.D., 1789–1864. American missionary in Ceylon and India from 1820. *Pamil and English Dictionary*, 1862.—His brother, HUBBARD, D.D., 1799–1864, was a pastor and teacher in Boston, and a prolific writer. *Intellectual* and *Moral Philosophy*, 1852–56.—His son, WILLIAM COPLEY, D.D., LL.D., D.C.L., b.1840, has been an active official of the Egyptian Exploration Fund, and writer on archæology.

Winsor, JUSTIN, LL.D., 1831–1897. Supt. Boston Public Library 1867–77; librarian of Harvard from 1877; ed. *Hist. Boston*, 4 vols., 1880–82, and *Narrative and Critical History of America*, 8 vols., 1884–89. *Columbus*, 1891; *The Mississippi Basin*, 1896.

Winston, JOHN ANTHONY, 1812–1871. Gov. of Ala. 1853–57.

Winston, JOSEPH, 1746–1815. Officer of N. C. troops 1776–82; M.C. 1793–95 and 1803–7.

Wint, PETER DE, 1784–1849. English water color painter.

Winter. Astronomically, from Dec. 21, the shortest day, to March 21, the vernal equinox. Generally speaking, the months of Dec., Jan. and Feb. in the U. S., and Nov., Dec. and Jan. in England; the three coldest months of the year. In the s. hemisphere June, July and August. The rainy season of the tropical zone corresponds to our winter.

Winter, JOHN STRANGE. See STANNARD, H. E.

Winter, WILLIAM, b.1836 in Mass. Poet, journalist, and writer on the stage; biographer of Edwin Booth 1871, and Henry Irving 1885. *The Jeffersons*, 1881; *Shakespeare's England*, 1886.

Winter Annual. Plant whose seedling lives through the winter, the plant dying after producing its seed the following summer.

Winterberry. *Ilex verticillata.* Red-berried shrub of the Holly family, native of swamps in e. N. America; known as Black Alder.

Winter Eggs. See SUMMER EGGS.

Wintergreen. 1. *Gaultheria procumbeus.* Diminutive shrub of the natural family *Ericaceæ*, yielding an aromatic essential oil. The plant is locally known also as Teaberry, Checkerberry, Partridgeberry, and Boxberry. 2. Plants of the genus *Pyrola*, of the same natural family. See SHIN-LEAF.

Wintergreen, FLOWERING. *Polygala paucifolia.* Low wood plant of the Milkwort family, native of e. N. America; known as Gay-wings.

Wintergreen, OIL OF. See METHYL SALICYLATE.

Wintergreen, SPOTTED. *Chimaphila maculata.* Low herbaceous perennial plant with evergreen mottled leaves, native of N. America.

Winterhalter, FRANZ XAVER, 1805–1873. German-French painter, chiefly of portraits.

Winter's Bark. *Drimys winteri.* Small tree of the natural family *Magnoliaceæ*, native of s. S. America; the bark is used in medicine.

Winter's Bark.

Winther, RASMUS VILLADS, 1796–1876. Danish poet.

Winthrop, JOHN, 1588–1649. Leader of the emigrants who founded Boston 1630; Gov. of Mass. 1630–34, 1637–40, 1642–44, and from 1646; eminent for purity and beauty of character. His *Journal* was pub. as *Hist. New England*, 1825–26.—His son, JOHN, F.R.S., 1606–1676, founder of Saybrook, Conn., 1635, and New London 1646, Gov. of Conn. 1635 and from 1657, was an accomplished man of high character. He procured 1662 the charter uniting Conn. and New Haven.—His son, JOHN, or FITZ-JOHN, 1639–1707, was agent of Conn. in London 1693–98, and Gov. from 1698.—His brother, WAIT STILL, 1643–1717, was Councilor, Major-gen., Judge, and Chief-justice in Mass.

Winthrop, JOHN, LL.D., F.R.S., 1714–1779. Great-grandson of the first John; prof. Harvard from 1738; eminent as an astronomer. *Earthquakes*, 1755; *Comets*, 1766.—His son, JAMES, 1752–1821, was a judge and writer on prophecy.

Winthrop, ROBERT CHARLES, LL.D., 1809–1894. M. C. 1841–50; Speaker 1847–49; U. S. Senator 1850–51; pres. Mass. Historical Society 1855–85; biographer of his ancestor, Gov. John, 1864–67. *Speeches*, 4 vols., 1852–86.

Winthrop, THEODORE, 1828–1861. Major U. S. Vols. 1861; killed at Big Bethel, Va. His novels, *Cecil Dreeme*, 1861, *John Brent*, 1862, and *Edwin Brothertoft*, 1863, reflect his chivalrous spirit. His minor works appeared in 2 vols. 1862–63.—His brother, WILLIAM WOOLSEY, U.S.A., b.1831, pub. *Military Law*, 1886.

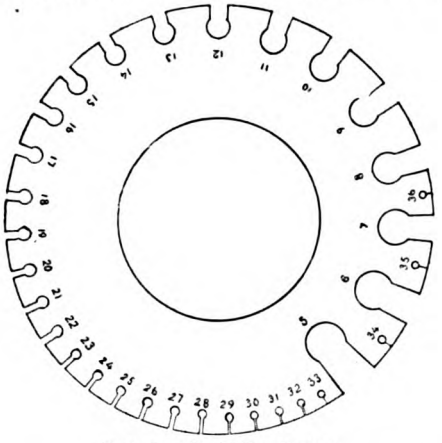
Winyaw Bay. Estuary formed by the confluence of the Black, Pedee, and Waccamaw rivers in Georgetown co., S. C. It is 14 m. long and 2 m. broad.

Winze. Small auxiliary shaft or opening connecting two levels in the interior of a mine, but not opening to the surface; constructed as an aid to ventilation or means of communication.

Winzet, NINIAN, 1518–1592. Scottish R.C. writer; teacher at Paris and Douay; abbot of Ratisbon 1577.

Wire and Wire Drawing. Wire is a small metallic rod varying in thickness. The ancients made their wire by hammering metal into thin sheets, cutting these sheets into strips, and hammering the strips into wire. The threads of gold in Aaron's dress were no doubt made in this manner. Pliny speaks of the interweaving of gold threads in dress-stuffs. In the modern method, metal is passed in a hot state through rolls forming rods, which in turn are drawn in a cold state through holes in a plate of harder metal, called a draw-plate. These draw-plates are made of hard steel pierced with holes varying in diameter by almost insensible degrees. The rods are drawn through a great number of holes in succession, so as to reduce their thickness gradually. By this continual compression the wire becomes very brittle and requires frequent annealing, and the oxide formed on the wire is removed by pickling in dilute sulphuric acid. Most wire is round, but other forms are made for special purposes. Some of the delicate wires are drawn through a plate made of ruby. See DUCTILITY, IRON WIRE, and WIRE GAUGE.

Wire Gauge. For measuring sizes of wire; the two in general use being the Birmingham and the U. S. standard

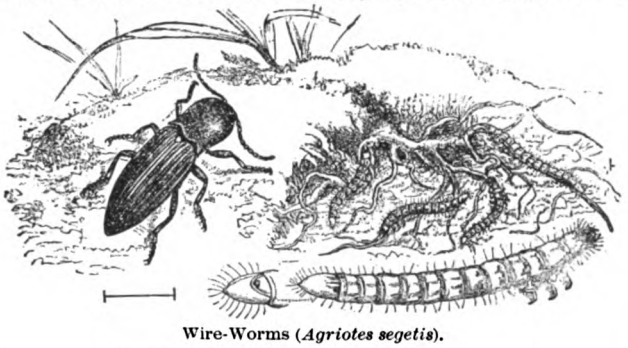


U. S. Standard Wire Gauge.

gauge. In both cases arbitrary numbers are used instead of actual diameters. See GAUGE, BIRMINGHAM.

Wire Rope. Rope of iron or steel wire, laid up, when flexibility is desired, of six strands of seven wires each around a hemp center, or of 12 or 19 wires in each of the six strands. The latter is most flexible. For standing-rigging, guys, etc., a wire center is used instead of hemp. The strength of iron wire rope in pounds = 4,480 times the weight per fathom in pounds; for steel wire use 7,098 as multiplier. Mild Bessemer steel and crucible cast-steel wire are used, as also iron wire. A wrought-iron wire rope one inch in diameter has an ultimate strength of ab. 18 tons.

Wire-Worms. Larvæ of Snapping-beetles. They resemble Millipeds ("Thousand legs") in being rounded, elongated, and brownish in color, but have only 3 pairs of legs, placed at



Wire-Worms (*Agriotes segetis*).

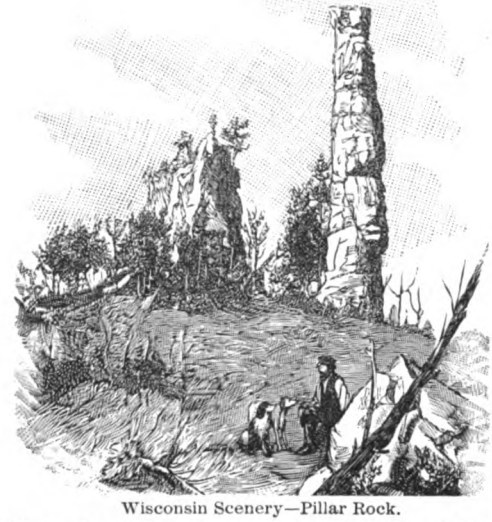
the front end. They spend two years or more in the ground, feeding on seeds and the roots of crops. Among the remedies recommended are fall plowing with thorough pulverization of the soil, trapping the adults, scattering seeds soaked in molasses and Paris green.

Wirt, WILLIAM, 1772–1834. Va. lawyer, U. S. Atty-gen. 1817–29. *Letters of a British Spy*, 1805; *Old Bachelor*, 1812; *Life of Patrick Henry*, 1817.

Wirtgen, PHILIPP, 1806–1870. German botanist. *Prodromus der Flora der Preussischen Rheinland*, 1842.

Wisby. Swedish town, on w. coast of Gothland Isl., in the Baltic, 130 m. s. of Stockholm; of great commercial importance from ab. 1000 till sacked 1361 by Danes. Pop., 1891, 7,102. See SEA LAWS.

Wisconsin. One of the n. central States; area 56,040 sq. m. Its surface presents little decided relief. The n. part is a broad elevation, constituting the divide between Lake Superior and the rivers flowing to the Mississippi. The remainder is undulating or covered with hills of glacial deposits. In the s. portion is considerable prairie land, while the n. part is covered with forests. The principal stream is the Mississippi, which forms part of the w. boundary and is navigable; it also contains the Rock, Wisconsin, and St. Croix Rivers. The geological structure is simple. In the n. part is a large area of Archæan rocks, extending in from the upper peninsula of Mich. Surrounding this on all sides is Cambrian of considerable breadth on the n., w. and s.; surrounding this and extending beyond the limits of the State on the e., s. and w. are Silurian beds. The industries are mainly agricultural, the cereals being the principal crop. The value of farms was, in 1890, $496,691,517, and of farm products, in 1889, $70,990,645. Manufactures of secondary interest. Beer, iron, lumber and leather are produced. The mineral resources only partially developed. Iron ore of great purity and in large quantity is found in the n., but the mines have scarcely reached the producing stage. Railroad mileage was 6,212 in 1896. The capital is Madison, the chief city Milwaukee. The beginnings of W., like those of Minn., were in the fur trade, 1656, and the French mission, 1669, on the shore of Green Bay. The rule of England was



Wisconsin Scenery—Pillar Rock.

felt in this region for some years after the Revolution, and it was not until after the war of 1812 and the formation of Astor's fur trading company that American influence became supreme. W. was originally a part of the Northwest Territory. In 1800 it was included in Ind., whence it passed to Ill., and in 1818 to Mich. In 1836 it was organized as a separate territory, and in 1848 was admitted as a State. It contains several distinct colonies of foreign settlers, Germans, Scandinavians, Swiss, and Belgians. Pop., 1890, 1,686,880. (See Map, page 1670.)

Wisconsin, UNIVERSITY OF. At Madison; organized 1849, opened 1851. Its College of Law was formed 1868, that of Engineering 1870, that of Political Science and History 1887. Two townships were appropriated for its support by Congress 1838; another grant was made in 1854. In 1866 it received 240,000 acres under the Morrill Act. The State has also made numerous and liberal subventions. It has 13 buildings, a domain of 240 acres; libraries of 44,000 vols., 78 professors, 36 instructors, 21 lecturers, and 1,598 students, of whom 818 are in letters and science, 207 in mechanics and engineering, 223 in law, and 190 in agriculture. All departments are open to women.

Wisconsin River. Branch of the Mississippi, rising in n. Wis. on the Mich. line, and flowing ab. 600 m. s. and w. Drainage area 11,520 sq. m., mean flow 11,399 cu. ft. per sec.

Wisdom. That intellectual virtue by which one selects true and right ends of action, and proper means for attaining these ends.

Wisdom, BOOK OF. Apocryphal book of the O. T., written in Greek during the latter half of the second century B.C.

Wisdom of Solomon. Apocryphal book of uncertain origin, received as canonical by the Roman and Greek churches; rejected by Protestants, though acknowledged to be of considerable intrinsic value.

Wise, DANIEL, D.D., b.1813 in England. Editor of M. E. publications; voluminous writer.

Wise, HENRY ALEXANDER, 1806–1876. M.C. 1833–39; Minister to Brazil 1844–47; Gov. of Va. 1856–60; Brig.-gen. C.S.A. 1861–65.—His cousin, HENRY AUGUSTUS, U.S.N., 1819–1869, Captain 1866, pub. *Los Gringos*, 1849, *Captain Brand*, 1860, and other tales and books of travel.

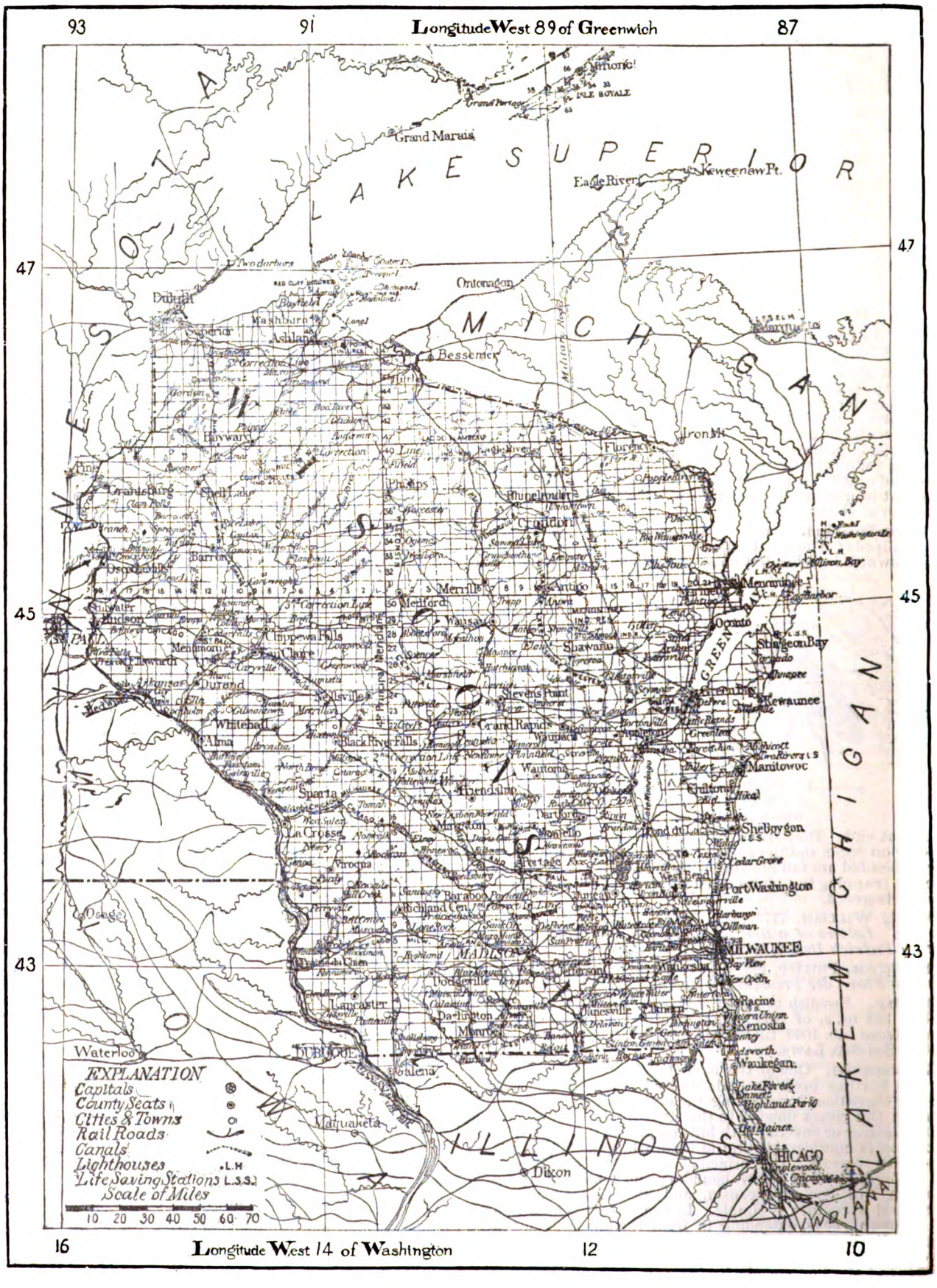
Wise, ISAAC MAYER, b.1819 in Bohemia. Rabbi in Cincinnati 1854; writer on Judaism.

Wise, JOHN, 1652–1725. Pastor at Ipswich, Mass., from 1683; persecuted by Andros and Dudley 1688; vigorous defender of civil and religious liberty. His *Churches' Quarrel Espoused*, 1710, and *Vindication*, 1717, repub. 1772 and 1860, exerted much influence.

Wise, JOHN, 1808–1879. American aëronaut, lost, after many ascensions, in Lake Michigan.

Wiseheart, G. See WISHART.

Wiseman, NICHOLAS PATRICK STEPHEN, D.D., 1802–1865.


93
91
Longitude West 89 of Greenwich
87
47
45
43
16
Longitude West 14 of Washington
12
10
LAKE SUPERIOR
MINNESOTA
MICHIGAN
LAKE MICHIGAN
ILLINOIS
IOWA
INDIANA
Grand Marais
Eagle River
Keweenaw Pt.
Ontonagon
Bessemer
Iron Mt.
Florence
Ashland
Washburn
Superior
Duluth
Hayward
Grantsburg
Spooner
Phillips
Rhinelander
Crandon
Barron
Osceola
Stillwater
Hudson
Menomonie
Chippewa Falls
Eau Claire
Durand
Merrill
Medford
Wausau
Menominee
Marinette
Oconto
Shawano
Stevens Point
Grand Rapids
Wisconsin Rapids
Appleton
Green Bay
Sturgeon Bay
Kewaunee
Manitowoc
Two Rivers
Chilton
Sheboygan
Port Washington
Cedar Grove
West Bend
Fond du Lac
Oshkosh
Neenah
Menasha
Waupaca
Wautoma
Black River Falls
Whitehall
Alma
Sparta
La Crosse
Viroqua
Prairie du Chien
Lancaster
Platteville
Mineral Point
Darlington
Monroe
Beloit
Janesville
Whitewater
Elkhorn
Delavan
Lake Geneva
Kenosha
Racine
Waukesha
Milwaukee
Watertown
Jefferson
Oconomowoc
Portage
Baraboo
Richland Cen.
Dodgeville
Mineral Point
Dubuque
Galena
Waterloo
Mazomanie
Dixon
Waukegan
Highland Park
Chicago
Wheaton
Ashland
Bayfield
Washburn
Superior
Duluth
Ontonagon
Bessemer
Iron Mt.
Florence
Menominee
Marinette
Oconto
Green Bay
Sturgeon Bay
Kewaunee
Manitowoc
Two Rivers
Sheboygan
Port Washington
Milwaukee
Racine
Kenosha
Waukegan
Chicago
Dixon
Dubuque
Galena
Waterloo
Mazomanie
Madison
Janesville
Beloit
Rockford
Elgin
Aurora
Joliet
Kankakee
Ottawa
Streator
Pontiac
Bloomington
Peoria
Galesburg
Quincy
Keokuk
Burlington
Davenport
Rock Island
Moline
Clinton
Dubuque
Galena
Freeport
Rockford
Elgin
Aurora
Joliet
Kankakee
Ottawa
Streator
Pontiac
Bloomington
Peoria
Galesburg
Quincy
Keokuk
Burlington
Davenport
Rock Island
Moline
Clinton
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lighthouses L.H.
Life Saving Stations L.S.S.
Scale of Miles
10 20 30 40 50 60 70

R. C. Abp. of Westminster and Cardinal 1850; active prelate and prolific writer. *Eucharist*, 1836–39; *Essays*, 3 vols., 1853. His *Fabiola*, 1854, is a touching story of the early Church.

Wiseman, RICHARD, d.1679. English surgeon.

Wishart, GEORGE, ab.1513–1546. Scottish reformer, burned at St. Andrews. He foretold Cardinal Beaton's death.

Wishart, GEORGE, D.D., 1609–1671. Scottish royalist, imprisoned 1639 and 1644; chaplain to Montrose 1645–46, and to Elizabeth of Bohemia 1650–60; Bp. of Edinburgh 1662. *Wars of Montrose*, 1647.

Wishbone. Furcula or united pair of clavicles of a fowl, frequently employed in sportive divination. Two persons grasp the forks of the bone with their little finger, at the same time making a wish. The one retaining the unbroken fork, upon their pulling the bone apart, is thought to have his wish.

Wish-Stone. Natural pebble, pierced with a hole, commonly regarded as lucky by English children. It is thrown into a stream with a wish.

Wislicenus, JOHANNES, b.1835. Prof of Chemistry at Würzburg 1872–85, and Leipzig since 1885. Most of his papers are pub. in *Annalen der Chemie.*

Wismar. Old Hanse town, on the Baltic, in Mecklenburg; chartered 1229; held by Sweden 1649–75, later by Denmark and Prussia. Its small coinage is extensive. Pop., 1890, 16,787.

Wissembourg. Town of Alsace, fortified 1706; scene of a brilliant but bloody victory of the Crown Prince of Prussia over the French, Aug. 4, 1870; held by France 1697–1871. Pop. ab. 6,000.

Wistar, CASPAR, M.D., 1761–1818. Prof. Univ. Pa. from 1792; founder of Wistar parties for the discussion of subjects of interest; pres. Philosophical Society 1815. *Anatomy*, 1814.—His grandson, ISAAC JONES, b.1827, was Brig.-gen. U. S. Vols. 1862–65.

Wistaria. Showy-flowered, woody vines of the genus *Kraunhia*, natural family *Leguminosæ*, natives of e. N. America and e. Asia; much planted for ornament; named from Dr. C. Wistar.

Wistaria (*Kraunhia chinensis*).

Wister, ANNIS LEE (FURNESS), b.1830, m. 1854. American tr. of German novels.

Wister, OWEN, b. ab.1860. Phila. author, grandson of Fanny Kemble. *Red Men and White*. 1896; *Lin McLean*, 1897.

Witchcraft. Imagined power, by certain mystic rites, of working harm to human beings or their possessions, especially by the infliction of disease, death, or invisible torments; superstition held in all ages, among all races, but most of all in Africa, where millions fall victims to it; in Christendom, held to imply a compact with the devil. The 12 Tables and the Code of Justinian provided for the punishment of witches. The Church followed Roman law,

Three Witches of Belvoir (Anne Baker, Joane Willimott, and Ellen Greene).

condemning soothsayers at the Council of Ancyra 315 to 5 years' penance. Papal bulls were issued against witchcraft 1484 and later, and caused untold misery. In the see of Bamberg, Germany, 600 were hanged or burned in 4 years, in that of Würzburg 900. In Geneva 400 were burned in 4 months in 1516, and 1,000 in the district of Como in 1524. During the Long Parliament 3,000 are said to have been put to death in Great Britain for sorcery. The Salem (Mass.) delusion broke out 1692 and cost 19 lives. English laws against witches were repealed 1736. The belief gradually yielded to the advance of Christian humanity, of scientific inquiry, and of a more rigorous science of evidence. The last execution of a witch in Europe was in Posen, Prussia, 1793, but they were burned judicially in Mexico in 1873. See SALEM WITCHCRAFT.

Witch-Hazel. *Hamamelis virginica.* Shrub of the natural family *Hamamelideæ*, bearing large leaves and yellow flowers which open in late autumn, native of e. N. America. A forked twig has been used as a divining rod. Alcoholic extract of the twigs is used in medicine.

Witch of Agnesi. Curve generated by a point so moving that its ordinate is to the ordinate of the corresponding point on a fixed circle having its diameter on the axis of x as the diameter of the circle to the abscissa of the moving point. Its rectangular equation is $y^2 = \frac{a^3}{x} - a^2$, where a is the diameter of the circle.

Witch of Endor. See ENDOR.

Witenagemot. English court or council 827–1066; composed of ealdormen, bishops, and chief thanes or nobles. Its claims were large, and sometimes its power.

Wither, GEORGE, 1588–1667. English lyric poet, officer under Parliament and Cromwell; imprisoned 1660–63. *Shepherd's Hunting*, 1614; *Hymns*, 1623; *Hallelujah*, 1641.

Withering, WILLIAM, 1741–1799. Physician in Birmingham. *Vegetables growing in Great Britain*, 1776–1830.

Witherite. $BaCO_3$. Natural barium carbonate, found in considerable quantity in England, and utilized as a raw material in the manufacture of barium salts for use in the arts.

Withe-Rod. *Viburnum nudum.* Tall shrub of the Honeysuckle family, native of swamps in e. N. America.

Withers, FREDERICK CLARKE, b.1828. American architect.

Withers, JONES MITCHELL, b.1814. Brig.-gen. C.S.A. 1861, Major-gen. 1862.

Withers, ROBERT ENOCH, b. 1821. Va. journalist; U. S. Senator 1875–81; Consul at Hong Kong 1885.

Witherspoon, JOHN, D.D., LL.D., 1722–1794. Pastor at Paisley 1757–68; pres. Coll. of N. J. from 1768; signer of the Declaration of Independence; active in Congress 1776–79 and 1780–83. *Works*, 1800–1.

Withrow, WILLIAM HENRY, D.D., b.1839. Ed. Toronto *Methodist Mag.* since 1874. *Catacombs*, 1874; *Hist. Canada*, 1878; *China*, 1893.

Witness. One who testifies in court.

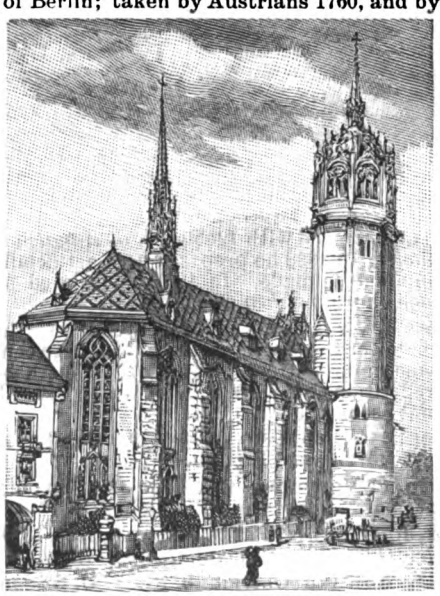
Witsius, HERMANN, 1636–1708. Prof. Franeker 1675, Utrecht 1680, and Leyden 1698. *Œconomy of the Covenants*, 1677, tr. 1763; *Creed*, tr. 1823; *Baptism*, tr. 1852.

Witte, EMANUEL DE, 1607–1692. Dutch painter.

Witte, NICOLAS, ab.1505–1565. Flemish missionary in Mexico.

Wittekind, d. 807. Saxon leader against Charlemagne 778 and 782–83.

Wittenberg. Town of Prussian Saxony, on the Elbe, 55 m. s.w. of Berlin; taken by Austrians 1760, and by Prussians



Schloss-Kirche (restored).

1814; fortified till 1873. Here Luther lived, nailed his 95 theses to the Schloss-Kirche door, burned the pope's bull, and was

buried. The university, founded 1502, was absorbed by Halle 1817. Pop., 1890, 14,458.

Wittrock, VEIT BRECHER, b. 1839. Swedish botanist.

Wittstock. In Brandenburg; scene of a Swedish victory over Saxons Oct. 4, 1636.

Witzel, GEORG. See WICELIUS.

Wladislas (or LADISLAUS) **I.,** ab. 1041–1095. Son of Bela I.; King of Hungary 1080; canonized 1192.

Wladislas I., d. 1333. King of Poland 1319.—II., d. 1434. King 1386.—III., d. 1444. King 1440; killed by Turks at Varna. —IV., d. 1648. King of Poland and Sweden 1632.

Woad. *Isatis tinctoria.* Herbaceous biennial plant used formerly for dyeing blue, and previous to the introduction of indigo was largely cultivated in various parts of Europe. See DYER'S WEED.

Woburn. City of Middlesex co., Mass., 10 m. n.w. of Boston; settled 1642, chartered 1888. Its manufactures are chiefly of leather. Pop., 1890, 13,499.

Wocheinite. $Al_2O_3,2H_2O$. Clay-like variety of the mineral bauxite, named from Lake Wochein, in Carniola, Austria.

Woden, or ODIN. God of the storm-cloud, and in some aspects of the sun, therefore represented as one-eyed; worshiped by all Teutons, though only by the Danes and Goths as supreme. See ODIN.

Wodrow, ROBERT, 1679–1734. Scottish historical writer. *Sufferings of Ch. of Scotland*, 1721–22; *Lives of Reformers*, 1834–35; *Analecta*, 4 vols., 1842–43. His *Correspondence*, 3 vols., 1842–43, was pub. by the Wodrow Society, formed 1841.

Woffington, MARGARET, 1720–1760. Irish actress, highly popular in London 1740–57; celebrated in Charles Reade's novel.

Wofford College. Founded 1851 by M. E. Ch. South at Spartanburg, S. C.; opened 1854. It has 8 teachers and ab. 150 students.

Wöhler, FRIEDRICH, 1800–1882. Prof. of Chemistry at Göttingen from 1836. He was an industrious worker in organic, inorganic, analytical and applied chemistry, ed. of *Handwörterbuch der Chemie*, and with Liebig ed. of *Annalen der Chemie und Pharmacie*. In 1828 he prepared urea artificially, the first organic compound so made. In 1827 he isolated aluminium. *Grundriss der anorganischen Chemie*, 1831.

Frederick Wohler

Wöhler's Law. In cases of repeated stress, the ultimate unit-stress is lower in degree as the range between the minimum and maximum stress is greater. Thus a bar may be broken by repetitions of stress none of which exceeds one-half of the ultimate strength.

Wohlgemüth, MICHAEL, 1434–1519. Painter of Nuremberg. Albert Dürer was his pupil.

Woivode, or VOIWODE. Governor of a Slavonic province; title of princes of Moldavia and Wallachia till 1716.

Wolcot, JOHN, M.D. ("PETER PINDAR"), 1738–1819. English satirist. *Lyric Odes*, 1782; *Lousiad*, 1785–95. *Works*, 5 vols., 1816.

Wolcott, EDWARD OLIVER, b. 1848. U. S. Senator from Colorado since 1889; active bimetallist.—His father, SAMUEL, D.D., 1813–1886, wrote many hymns.

Wolcott, J. See WOLCOT.

Wolcott, ROGER, 1679–1769. Conn. councilor 1714; Judge of Supreme Court 1732; Major-gen. 1745, next in command to Sir W. Pepperell at Louisburg; Gov. of Conn. 1750–54.—His son, ERASTUS, 1722–1793, was Col. 1776, Brig.-gen. 1777, and later Judge Conn. Supreme Court.—His brother, OLIVER, 1726–1797, was in Congress 1776, 1778, and 1780–84; signer of the Declaration of Independence; Gen. of Conn. troops 1776, and commander of a brigade at Burgoyne's surrender; Councilor of Conn. 1774–86, Lieut.-gov. 1786–96, and Gov. 1796.—His son, OLIVER, 1760–1833, was auditor U. S. Treasury 1789–91, Comptroller 1791–95, and Sec. 1795–1800; Judge U. S. Circuit Court 1801–2; merchant and banker in New York 1802–14; Gov. of Conn. 1817–27.

Wolf (CANIS LUPUS). Carnivore of section CYNOIDEA (q.v.), widely distributed, of many species and varieties, but absent from S. America, Africa, Ceylon, Australia, and since 1766 extinct in Great Britain. The most common color is gray, but there are black wolves in Florida and the Pyrenees, red ones in Texas, and those of n. Russia and Scandinavia turn white in winter. The resemblance of wolves of various regions

Wolf (*Canis lupus*).

to the dogs of the same have led naturalists to suppose that the dogs are domesticated wolves. Wolves have been tamed and have shown attachment to their masters; but they do not bark, though barking is not a fixed characteristic of all dogs. Wolves hunt in packs and run down their prey. The female brings forth 4 or 5 young after a period of gestation of 63 days, as in the dog. The small wolf of the Western prairies is the coyote or American jackal.

Wolf, or I SPY. Game similar to Whoop and Hide and Seek.

Wolf, CHRISTIAN. See WOLF, JOHANN C.

Wolf, EDMUND JACOB, D.D., b. 1840. Prof. Gettysburg 1874. *Lutherans in America*, 1890.

Wolf, FERDINAND, 1796–1866. Austrian writer on mediæval literature, especially Spanish and that of the Romance languages.

Wolf, FRIEDRICH AUGUST, 1759–1824. Prof. Halle 1783–1807, and later in Berlin; editor of sundry classics; eminent as scholar, critic and teacher. Philology he called "Knowledge of human nature as exhibited in antiquity." His *Prolegomena ad Homerum*, 1795, which disputed the authorship and unity of the Homeric poems, began a discussion which is still unsettled. He may be called the originator of the encyclopedic method of classical study which prevails to-day.

Wolf, GEORGE, 1777–1840. M.C. 1823–29; Gov. of Pa. 1829–35: "father of the public school system"; Comptroller U. S. Treasury 1836–38.

Wolf, HIERONYMUS, 1516–1580. Teacher at Augsburg from 1557; editor of Demosthenes and other Greek authors.

Wolf, or **Wolff,** JOHANN CHRISTIAN VON, 1679–1754. Prof. Halle 1706–23 and 1740; prof. Marburg 1723–40; Chancellor of Halle 1743. His system of philosophy, based on Leibnitz and largely mathematical, was long in high repute. *Theologia Naturalis. Works*, 22 vols.

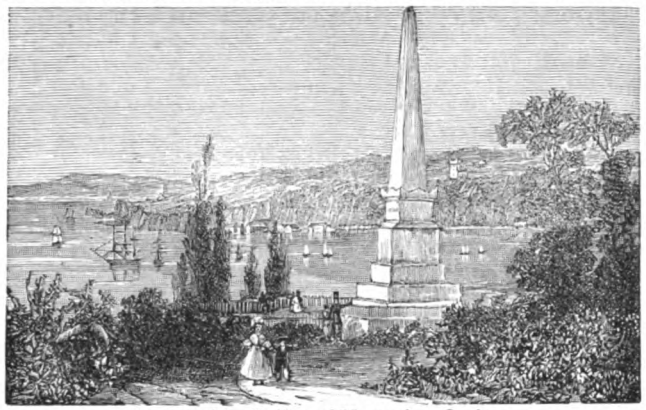
Wolf, JOHANN CHRISTOPH, 1683–1739. Teacher at Hamburg from 1712. *Bibliotheca Hebræa*, 4 vols., 1715–33.

Wolf Children. Stories of abandoned children nurtured by wolves (as Romulus and Remus) are common among primitive peoples, and of frequent occurrence among American tribes. Cases are recent in India.

Wolf Dog. Dog bred to protect sheep from the attack of wolves. He is of no particular breed, and is found principally in Spain; also a cross between a wolf and dog; such hybrids are found among the dogs of the N. American Indians.

Wolfe, CHARLES, 1791–1823. Irish poet, known by his lyric, *Burial of Sir John Moore*, 1817. *Remains*, 1825.

Wolfe, GEN. JAMES, 1727–1759. English Major-gen. 1759, in command of the expedition against Canada. Killed at



Monument to Wolfe and Montcalm—Quebec.

Quebec, in the victory over Montcalm which determined the ascendency of the Anglo-Saxon race in the New World.

Wolfe, JOHN DAVID, 1792–1872. Philanthropist of New York.—His daughter, CATHARINE LORILLARD, 1828–1887, was also noted for her benefactions.

Wolfenbüttel. Town of Brunswick, on the Oker; founded 1046; besieged and taken 1193 and 1542; scene of a battle 1641; noted for its large library. Pop., 1890, 14,480.

Wolfenbüttel Fragments. Written by Reimarus; ed. by Lessing, 1773–81; regarded as deistical, and productive of much commotion in Germany.

Wolff, ALBERT, 1814–1892. German sculptor, prof. Berlin 1866.

Wolff, ALBERT, 1835–1891. Journalist, critic, and novelist, b. in Germany; in Paris from 1857.

Wolff, CASPAR FRIEDRICH, 1733–1794. German anatomist, from whom the Wolffian Body and Duct were named.

Wolff, JOSEPH, D.D., LL.D., 1795–1862. German Hebrew, R.C. student 1812–18; Anglican missionary to Jews 1821. His *Mission to Bokhara*, 1845, records a dangerous expedition. *Journal*, 1824–39; *Researches and Missionary Labors*, 1835; *Travels and Adventures*, 1860.

Wolffian Body. See MESONEPHROS.

Wolffian Bottles. Employed for dissolving or purifying gases; named from Peter Woulfe, 1727–1806, chemist in London.

Wolffian Duct. That of the primitive embryonic kidney, split off dorsally from the archinephric duct in the region of the meso- and meta-nephros. In the male it becomes specialized into a vas deferens and a ureter. It aborts more or less in the female, represented by HYDATIDS, PAROVARIUM, EPOÖPHORON, PAROÖPHORON, and Gaertner's DUCT (q.v.).

Wolffian Tubules. See MESONEPHROS.

Wolf-Fish (ANARRHICHAS LUPUS). Acanthopterygian fish of Blennoid affinities, inhabiting the N. Atlantic; also called

Wolf-Fish (*Anarrhichas lupus*).

the Sea Cat. It has powerful carnivorous teeth, which are used to break shell-fish. It is very pugnacious, and at Eastport, Me., has been known to attack persons while wading.

Wölfflin, EDUARD, b. 1831. Prof. Zurich 1869, Erlangen 1875, and Munich 1880; writer on Latin grammar and etymology; editor of several classics; founder *Archiv fur Lat. Lexicographie.*

Wolfram. See TUNGSTEN.

Wolframite. $(Fe,Mn)WO_4$. Natural iron and manganese tungstate, most important source of tungsten and the tungsten compounds used in the arts. In small quantity it is rather widely distributed in nature, especially in connection with tin ore, but its commercial production is practically limited to the Cornwall mining district in England and the vicinity of Zinnwald in Saxony and Bohemia.

Wolfram von Eschenbach. See ESCHENBACH.

Wolfsbane. See ACONITE.

Wolgemut. See WOHLGEMUTH.

Wollaston, WILLIAM, 1659–1724. English rational theologian. His *Religion of Nature*, 1722, was based on S. Clarke's views, and was much valued by Bp. Butler.—His great-grandson, WILLIAM HYDE, M.D., F.R.S., 1766–1828, chemist and physicist of high rank, discovered the dark lines in the solar spectrum, the metals palladium and rhodium, and the mode of rendering platinum malleable. He was sec. of the Royal Society 1806–20, and its pres. 1820.

Wollastonite. $CaSiO_3$. Natural calcium silicate, sometimes called Tabular Spar, and resembling several of the zeolites and the light-colored varieties of amphibole.

Wollaston, LAKE. In Canada, on the Arctic Circle, between Mackenzie and Churchill Rivers.

Wollaston's Doublet. Combination of two plano-convex lenses to replace a single double convex lens. Each lens is less convex than the simple lens which they replace, yet their joint magnifying power is as great and with less spherical aberration.

Wolle, FRANCIS, 1817–1893. Botanist of Pa.; inventor 1852 of a machine since widely used for making paper bags. *Desmids of U. S.*, 1884; *Fresh-Water Algæ*, 1887.—His father, PETER, 1792–1871, was a Moravian bishop.

Wollstonecraft, MARY. See GODWIN, WILLIAM.

Wolowski, LOUIS FRANÇOIS, 1810–1876. B. in Poland; prof. Paris 1839, Deputy 1849; writer on Finance.

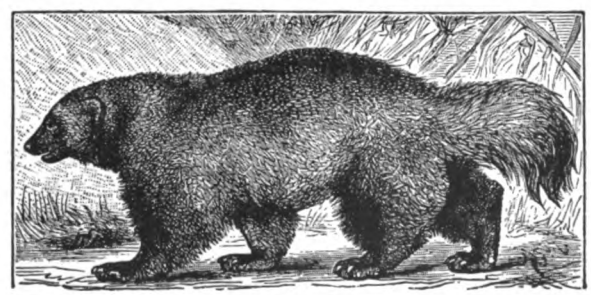
Wolseley, GARNET JOSEPH, D.C.L., LL.D., VISCOUNT, b. 1833. Irish officer, distinguished in the Crimean war 1854–55, and in the Indian mutiny 1857–59; in Canada 1862–70, where he suppressed the first Riel rebellion; knighted 1871; victor over the Ashantees 1873; Major-gen. 1875; Gov. of S. Africa 1879; Commander-in-chief in Egypt 1882 and 1884–85, where he defeated Arabi at Tel-el Kebir Sept. 13, 1882; General and Baron 1882, Viscount 1885; Field-marshal 1894; biographer of Marlborough.

Wolsey, THOMAS, 1471–1530. Dean of Lincoln 1509; Privy Councilor 1511; Abp. of York 1514, Cardinal and Lord Chancellor 1515; papal legate with plenary power 1519, envoy to Charles V. 1521, and to Francis I. 1527; eminent as statesman and patron of learning, but hated for wealth, power, pomp, and pride rivaling the king's; disgraced Oct. 1529; charged with treason and arrested 1530; celebrated by Shakespeare.

Wolstan. See WULFSTAN.

Woltmann's Anemometer. Form first described ab. 1790, consisting of small plates at the extremities of radial arms. The plates are so inclined that the wind causes the arms to revolve. This is the parent of the modern Wind-Meter, Patent Tide-Meter, etc.

Wolverene (GLUTTON). This Carnivore attains a length of 3 ft. besides the tail, 8 in. It is blackish, with a broad arched back, semiplantigrade feet, and short legs. It is as voracious



Wolverene (*Gulo luscus*).

and cunning as its congener the Weasel. It inhabits northern forests, and is most abundant in the Mackenzie River basin, where it seriously annoys trappers, stealing their bait and the animals captured. What it cannot eat it buries or befouls by

means of a fetid secretion from anal glands. Its fur is valuable, but it can be trapped only by secret or hidden traps. The female brings forth 4 or 5 young in late June in burrows. See MUSTELIDÆ.

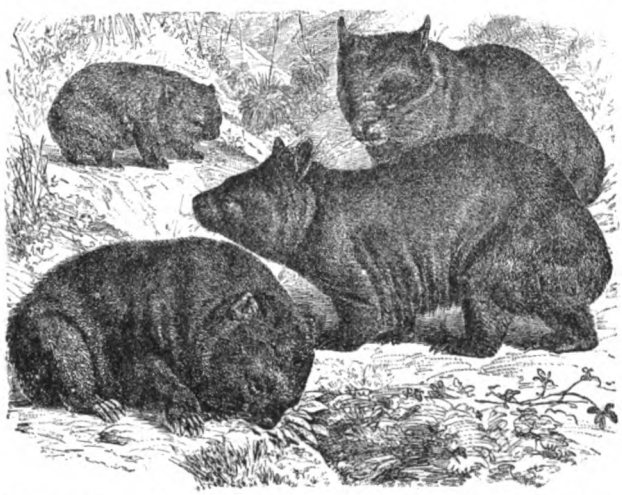
Wolverhampton. Borough of Staffordshire, 13 m. n.w. of Birmingham. It has a large local trade, and important manufactures of hardware, tin, japanned and plated ware. Its locks have long been famous. Pop. 82,620; of parliamentary borough, 174,325.

Wolzogen, CAROLINE VON (LENGEFELD), 1763–1847. German novelist, biographer of Schiller 1830. *Cordelia*, 1840.

Woman's Christian Temperance Union. Founded 1874 in Ohio; since widely extended throughout the U. S. The World's W. C. T. U. was organized 1883, and has branches in many countries. Frances E. Willard was pres. of both.

Womb. See UTERUS.

Wombats. Nocturnal Marsupials of S. Australia and Tasmania. There are 3 living species; the largest attain a wt. of 100 lbs. or more and a length of 3 ft. They resemble Badgers,



Wombats (*Phascolomys wombat*); in upper left-hand corner, *P. latifrons*.

the tail is rudimentary, legs short and thick, resembling those of a bear. The feet are adapted for burrowing. They feed on roots, and have a skull and teeth resembling those of the Beaver. Their color is black to yellowish brown. See RHIZOPHAGA.

Women's Rights. Those rights which have been denied women on account of their sex. The first organized effort was made in the U. S. by Elizabeth C. Stanton and Lucretia Mott, who called conventions in Rochester and Seneca Falls, N. Y., in 1848. In 1850 a national committee was formed, and since 1869 the national association has held annual meetings in Washington, D.C. In 1866, some of the members registered and voted, claiming that women, as well as slaves, were enfranchised by the 13th, 14th, and 15th amendments. This was denied by Congress and the Supreme Court, and created a demand for a 16th amendment forbidding the disfranchisement of women, and in 1894 a petition containing 625,000 names was presented to Congress asking for an amendment to the Constitution, striking out the word "male" from section 1, article 2. Partial suffrage has been obtained in some States and countries. In many countries of Europe, in Australia, New Zealand, Canada, and in some parts of India, women vote for municipal or school officers. In Finland, Denmark, and Sweden women vote for all officers except members of Parliament. In Croatia and Dalmatia they vote in person, and in Austria-Hungary by proxy, and in Italy widows vote by proxy. In Asiatic Russia, women householders vote, and in European Russia women who are heads of families have a vote. In Norway, women have school suffrage, while in France the women teachers elect women on the boards of education. Woman suffrage exists in a limited way, mainly in the selection of school officers, in Ariz. Ter., Del., Idaho, Ill., Ind., Ia., Kan., Ky., Mass., Mich., Minn., Mont., Neb., N. H., N. J., N. Dak., O., Okla. Ter., Ore., S. Dak., Tex., Vt., Wash., and Wis. In Col., Utah, and Wyo. women have full suffrage, voting for all officers, including Presidential, electors. Full suffrage has been denied in Me., Cal., Conn., Del., Mass., Mont., Neb., Nev., and Okla. Ter.

Wonders, SEVEN. See SEVEN WONDERS OF THE WORLD.

Wood. Hard portions of the stems of plants, consisting mostly of fibers and vessels, prosenchymatous tissue.

Wood, STRENGTH OF. As average values the ultimate strength may be taken as 10,000 lbs. per sq. inch in tension and 8,000 in compression.

Wood, ALPHONSO, 1810–1881. American botanist. *Class-Book of Botany*, 1845; *American Botanist and Florist*, 1870.

Wood, ANTHONY À, 1632–1695. English antiquarian, whose *Athenæ Oxonienses*, 1691–92, is of high biographical value. *Hist. and Antiquities Univ. Oxford*, 1674, repub. in 5 vols. 1786–96; *City of Oxford*, 1773.

Wood, CHARLOTTE MATILDA (VINING), b. 1836. Anglo-American actress and manager.

Wood, DE VOLSON, b.1832. Prof. Univ. Mich. 1857–72, and Stevens Institute, Hoboken, N. J., since 1872; writer on mathematics and engineering. *Mechanics*, 1876–84.

Wood, ELEAZER DERBY, U.S.A., 1783–1814. Lieut. 1806; distinguished at Niagara; killed at Fort Erie.

Wood, ELLEN (PRICE), (MRS. HENRY), 1814–1887. English novelist; ed. *Argosy* 1867. *East Lynne*, 1861; *Shadow of Ashlydyat*, 1863.

Wood, SIR EVELYN, b.1838. Brig.-gen. 1879; prominent in the Zulu war; knighted 1879; Commander in Egypt 1882; Quartermaster-gen. 1893.

Wood, FERNANDO, 1812–1881. M.C. 1841–43, 1863–65, and 1867–77; Mayor of New York 1854–58 and 1860–61. He favored secession, as did his brother, BENJAMIN, b.1820, M.C. 1861–65.

Wood, GEORGE, 1799–1870. American author. *Modern Pilgrim*, 1855; *Gates Wide Open*, 1858–69.

Wood, GEORGE BACON, M.D., LL.D., 1797–1879. Prof. Univ. Pa. 1835–60. *Practice of Medicine*, 1847; *Therapeutics and Pharmacology*, 1856; *Lectures*, 1859. His *U. S. Dispensatory* (with Dr. F. Bache), 1833, has been widely used.—His nephew, HORATIO C., M.D., LL.D., b.1841, prof. Univ. Pa. since 1866, ed. the later editions of this work, and pub. *Therapeutics*, 1875, and *Nervous Diseases*, 1886.

Wood, JAMES, 1750–1813. Va. Col. 1776; Gov. 1796–99.

Wood, JAMES FREDERIC, D.D., 1813–1883. R. C. coadjutor Bp. of Phila. 1857, Bp. 1860, Abp. 1875.

Wood, JAMES RUSHMORE, M.D., 1816–1882. Prof. of Surgery at Bellevue Med. School from 1861.

Wood, JOHN, 1798–1860. Founder of Quincy, Ill., 1822; Gov. 1859–60.

Wood, JOHN GEORGE, 1827–1889. English author. *Natural History*, 1859–63; *Man*, 1868–70; *Homes Without Hands*, 1869; *Man and Beast*, 1874; *Dominion of Man*, 1890.

Wood, JOSEPH, d.1789. Pa. Col. 1776; in Congress from Ga. 1777–79.

Wood, REUBEN, 1792–1864. Judge Ohio Supreme Court 1833–45; Gov. 1849–51.

Wood, SEARLES VALENTINE, 1830–1884. English geologist, attentive chiefly to the Tertiary and Post-tertiary formations. —His father, SEARLES V., wrote on the Pliocene *Mollusca*.

Wood, THOMAS JEFFERSON, U.S.A., b.1823. Brig.-gen. U. S. Vols. 1861, serving mostly in Tenn. and Ga.; distinguished at Chickamauga and Nashville; Major-gen. 1865–66.

Wood, THOMAS WATERMAN, b.1823. American painter. N.A. 1871; pres. N.A. since 1891.

Wood, WALTER ABBOTT, b.1815. Inventor and manufacturer of mowers, reapers, etc.; M.C. from N. Y. 1879–83.

Wood, WILLIAM, ab.1580–1639. Immigrant to Mass. 1629. *New England's Prospect*, 1634.

Wood, WILLIAM BURKE, 1779–1861. American actor and manager. *Recollections*, 1855.

Wood, WILLIAM MAXWELL, M.D., 1809–1880. Surgeon-gen. U. S. Navy 1869. *Wandering Sketches*, 1849; *Fankwei*, 1859.

Woodberry, GEORGE EDWARD, b.1855. Prof. Univ. Nebraska 1880–82, and Columbia 1892; poet; biographer of Poe, 1885.

Woodbine. See HONEYSUCKLE.

Woodbridge, WILLIAM, 1780–1861. Judge Mich. Supreme Court 1828–32; Gov. 1839–41; U. S. Senator 1841–47.

Woodbury, DANIEL PHINEAS, U.S.A., 1812–1864. Major of Engineers 1861; Brig.-gen. U. S. Vols. 1862, serving in Va. till 1863; distinguished at Fredericksburg; commanding at Key West, Fla., 1863. *Sustaining Walls*, 1845; *Theory of the Arch*, 1858.

Woodbury, LEVI, 1789–1851. Judge N. H. Supreme Court 1817; Gov. 1823–24; U. S. Senator 1825–31 and 1841–45; Sec. Navy 1831–34, and Treasury 1834–41; Justice U. S. Supreme Court from 1845. *Writings*, 1852.

Woodburytype. See PHOTO-MECHANICAL PRINTING.

Wood-Carving. See CARVING.

Wood-Cells. See PROSENCHYMA and TRACHEIDS.

Woodchuck, or GROUND-HOG. See ARCTOMYS.

Woodcock (*Philohela minor*, American, and *Scolopax rusticula*, European species; other species are in Java). Crepuscular snipe that prefers the drier woodlands to marshes. It has a long bill, short legs, large eyes, and a beautiful mottled plumage, and is noted as a game-bird. It is migratory, and has been supposed to have crossed the Atlantic from Europe to America. The American species is smaller than the European, and its 3 outer primaries are attenuated. The food is earthworms, etc. They pair in Feb., and lay four eggs in a nest on the ground near water in March. Two broods are raised. They moult in Aug. It is said that the parents carry the newly hatched young to better feeding grounds.

Woodcock (*Scolopax rusticula*).

Wood-Duck (AIX SPONSA). N. American duck, nesting in trees. The male has a large crest, head green, purple and violet, back velvety black with metallic tints, breast chestnut, spotted with white, belly white. The female has gray head, greenish crown, and white throat. The upper parts are grayish brown, chest brown and spotted. Length 18 in. In the West, this name is applied to the Hooded Merganser.

Wood-Duck (*Aix sponsa*).

Wooden Bridge. One having all members of wood, or all except the tensile members of the web. Wood was used for bridges exclusively till ab.1800, when a few iron structures were built. Combination bridges, of wood and wrought-iron, came into use ab.1840. See HOWE TRUSS, LONG TRUSS, and TOWN TRUSS.

Wood Engraving. This is said to have been practiced in China and Japan from very remote times; supposed by some to have been brought thence to Europe, where it first appeared, in s. Germany, ab.1400. The earliest known wood engraving, dated 1423, is a colored print of St. Christopher, 8 in. by 11½, one of a series of pictures of saints (*helgen*) issued by the monks as religious tracts. It has been a question whether European wood-engraving originated for this purpose or was first used in the nearly contemporary manufacture of playing-cards. The pious intent has the greater likelihood. The first books with wood-cuts were known as block-books, pictures with explanatory texts, both engraved on the same planks. On the invention of movable type these were followed by what we now call illustrated books, the designs subservient to the text. One of the most important is the *Nurnberg Chronicle*, 1493, with some 2,000 cuts. Durer's great works, the *Apocalypse*, a larger and a smaller *Passion of Christ*, and the *Life of the Virgin*, pictorial subjects with effect, the *Triumphal Arch of Maximilian* (92 blocks forming a whole 9 ft. by 10½), and a *Procession* of 135 designs by Durer and Burgkmair (170 ft. long and 16 in. high), marked the period 1490–1510. In the 16th century the art was extensively practiced, most notably in Holbein's *Dance of Death*, pub. at Lyons 1538. Little is known of the engravers: Jerome Andreæ of Nurnberg stands forth as the best of those employed by Durer, and the names of Dienecker and others appear on the backs of the Pro-

St. Christopher and the Christ-child (1423).

cession blocks; Hanns Lutzelburger of Basel engraved the *Dance of Death*. All these works were done with knives, the engraver leaving the lines drawn for him in relief, on the surface of the plank, so that the print might be taken from the surface in the same manner as type. Similar relief work was also cut in metal, copper or pewter, but with gravers instead of knives. After 1600 wood-engraving was mainly superseded by copper. Before 1800 it had been found that on cross-sections of boxwood gravers could be used as on metal; so that, no longer dependent on black lines drawn on the face of the wood, the engraver could invent his own lines with the graver, such lines, of course, white, as the print was still from the surface. This more artistic method marked specially the work of Thomas Bewick in his *Fables*, *Quadrupeds*, and *Birds*, produced 1784–1818. His most noted pupils and helpers were Clennell (also a painter), Nesbit, and Harvey. Robert Branston worked in the same way, but with more imitation of copper. His pupil, John Thompson, greatly indebted to the designs of Thurston, ranks as ablest of wood-engravers: Clennell and Bewick are superior as artists. William Harvey, after promise of excellence, gave up engraving for design. The more artistic white line manner distinguishing the Bewick school, partly departed from by Thompson, was afterward neglected, and has been replaced by a feeble imitation of the refinement of copper. At the present time the design is drawn upon boxwood or transferred by photography and cut by gravers.

Woodfall, HENRY SAMPSON, 1739–1805. Ed. London *Advertiser* 1760–93; tried 1770 for publishing Junius' *Letters*, which he collected 1772.

Wood Fern. See SHIELD-FERN.

Woodford, STEWART LYNDON, b.1835. Lieut.-gov. of N.Y. 1866–68; M.C. 1873; U. S. Attorney for s. N. Y. 1877–83. Minister to Spain 1897–98.

Wood-Grass. See GRASS, INDIAN.

Woodhouse, JAMES. M.D., 1770–1809. Prof. Univ. Pa. from 1795; promoter of the use of anthracite coal; chemical writer.

Woodhouselee. See TYTLER, WILLIAM.

Wood-Ibis (*Tantalus loculator* of s. U. S.). White Stork with a bill curved down near its end, which is blunt; the toes are long. Its head is bald and blue, its wings and tail are black. *Pseudotantalus rhodinopterus* of Ethiopia has a yellow bill, red feet, white plumage, and roseate wing coverts.

Wood-Louse. See ISOPODA.

Wood-Naphtha. See METHYL ALCOHOL.

Wood Oil. Aromatic drying oil, obtained from Burmah and the Straits, being the product of various species of *Dipterocarpus*. It is used in making varnish, lithographic ink, and as a substitute for copaiba, which it resembles closely.

Wood Opal. Wood converted into opal by silicification.

Woodpeckers. Ab. 350 species, distributed over the world

(except Australia, Madagascar, and Egypt), are known. A common European genus is *Dendrocopus*, Great Spotted Woodpecker; the most common in U. S. is *Melanerpes*. *M. Carolinus* is the Red-bellied, *M. erythrocephala* the Red-headed, Woodpecker. *Colaptes auratus* is the Golden-winged Woodpecker or "Flicker." The Pileated Woodpecker is black with scarlet crest, and is 18 in. long, of which the tail measures 7 in. (see SAPSUCKER). The Woodpecker is a shy, usually solitary, brightly colored bird, frequenting heavy woods, running up trees, tapping them with its strong, sharp beak; by means of a long, extensible tongue having barked filaments at the tip, it extracts insects from their holes. The hyoid bone has greatly lengthened thyrohyal cornua that arch over the skull. *M. formicivorus* of Cal. has the curious habit of making the bark of pines full of holes, into which it hammers acorns and sometimes pebbles. See PICIDÆ.

Wood Preserving. See PRESERVATION OF TIMBER.

Wood-Rats. See RATS.

Woodrow, JAMES, D.D., b.1828. Prof. Columbia, S. C., Theol. Sem. 1861–84. and S. C. Univ. 1880–91; pres. S. C. Coll. from 1891; ed. *Southern Presbyterian* from 1865.

Woodruff, HIRAM, 1817–1867. American horse-trainer. *Trotting-Horse*, 1869.

Woodruff, WILFORD, b.1807. Mormon apostle 1839, pres. 1887.

Woods, KATHERINE PEARSON, b.1853. American novelist. *Metzerott, Shoemaker*, 1890.

Woods, LEONARD, D.D., 1774–1854. Prof. Andover 1808–46; controversialist. *Letters to Unitarians*, 1820; *Works*, 5 vols., 1849–50.—His son, LEONARD, D.D., LL.D., 1807–1878, was pres. Bowdoin 1839–66.—His nephew, ALVA, D.D., 1794–1887, was prof. Brown Univ. 1824–28, pres. Transylvania, Ky., 1828–31, and Univ. Ala. 1831–37.

Woods, MRS. MARGARET. English novelist. *A Village Tragedy*, 1894; *Vagabonds*, 1895; *Weeping Ferry*, 1897.

Woods, VIRUA, b.1864. Novelist of Cal. *A Modern Magdalen*, 1894; *Jason Hildreth's Identity*, 1896.

Woods, WILLIAM BURNHAM, 1824–1887. Col. Ohio Vols. 1861–65, serving in the West; Brig.-gen. 1865–66; Chancellor of Ala. 1868; U. S. Judge 1869; Justice U. S. Supreme Court 1880. —His brother, CHARLES ROBERT, U.S.A., 1827–1885, was Brig.-gen. U. S. Vols. 1863–66.

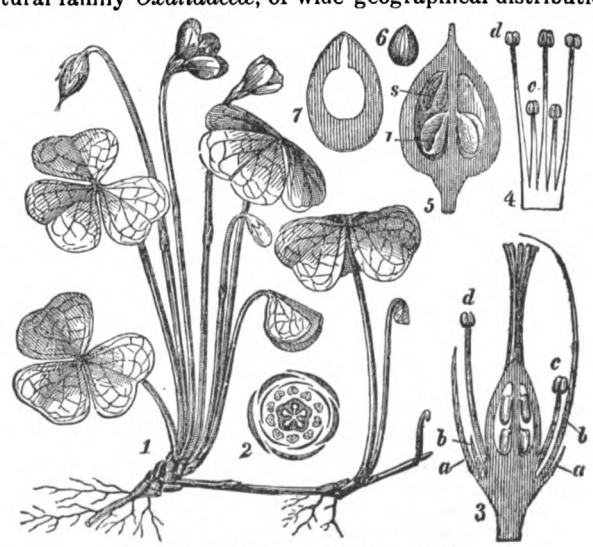
Woods and Forests. Source of British revenue, administered since 1810 by commissioners.

Wood's Halfpence. Copper pieces minted 1722–23 for Ireland by Wm. Wood; made unpopular by Swift's *Drapier's Letters*, and the privilege withdrawn.

Wood's Holl. Hamlet on Buzzard's Bay, Mass., site of an important station of U. S. Fish Commission.

Wood's Metal. Fusible alloy, consisting of bismuth 4 parts, lead 2 parts, tin 1 part, cadmium 1 part. It melts at 60.5° C.

Wood-Sorrel. Showy-flowered herbs of the genus *Oxalis*, natural family *Oxalidaceæ*, of wide geographical distribution.



Common Wood-Sorrel (*Oxalis acetosella*).

Some species are cultivated for ornament. The common variety is found in damp, deep shade. It is also known as stubwort and cuckoo-bread, and is held by some to be the original Irish shamrock. The fresh plant contains 0.75 per cent of potassium binoxalate.

Wood-Spirit. See METHYL ALCOHOL.

Woody Nightshade. See BITTERSWEET.

Wood-Thrush (TURDUS MUSTELINUS). Exquisite songster of e. U. S., living in thick woods on hillsides near watercourses. Length 8 in., tail 3 in.; color cinnamon brown, shading to olive on rump. Large dusky spots on breast. It feeds on insects, and nests in May, raising two broods.

Wood Tin. See TIN.

Woodville, RICHARD CATON, 1825–1855. American genre painter.

Woodville, ELIZABETH. Queen of Edward IV. 1464. This marriage offended the Earl of Warwick, who forced Edward to flee from England 1469.

Woodward, BERNARD BOLINGBROKE, 1816–1869. English author and translator. *Hist. Wales*, 1850–52; *Hist. U. S.*, 1855; *Chronology*, 1872.

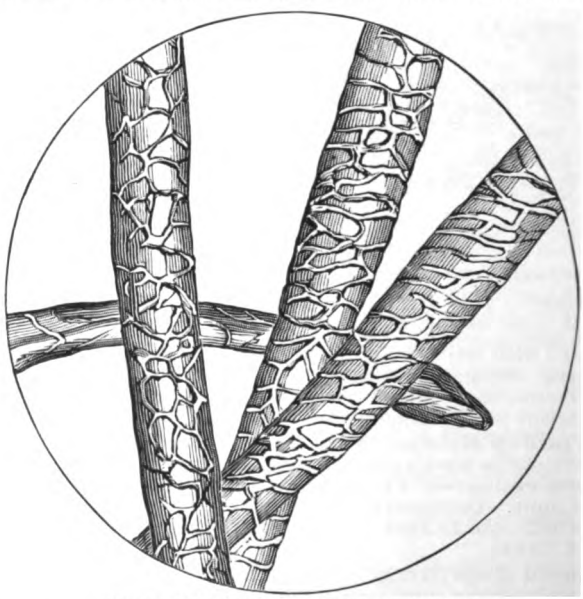
Woodward, GEORGE WASHINGTON, 1809–1875. Judge Pa. Superior Court 1852–67; M.C. 1867–73.

Woodward, JOSEPH JANVIER, M.D., 1833–1884. Surgeon U.S.A.; microscopist. *Medical Hist. Rebellion*, 1870–79.

Woodward, ROBERT SIMPSON, b.1849. Prof. Columbia 1893; writer on mathematics and astronomy.

Woodworth, SAMUEL, 1785–1842. American editor, poet, and playwright, author of "The Old Oaken Bucket."

Wool. Hair-like, wavy covering of certain animals, used for the manufacture of fabrics. The wool of the sheep is mostly employed, while that of the alpaca, llama, camel, Cashmere and Angora goat is also used. Under the microscope, wool is seen to consist of wavy threads or fibers, each of which is covered with scales attached only by their bases; and to the interlocking of these scales is due the readiness with which the wool can be



Fibers of Wool (Magnified, showing Scales).

compacted into fabrics. The greater part of the wool of commerce is fleece wool, clipped from the living sheep; pulled wool is obtained from the skins of dead sheep. In 1896 the U. S. produced 272,474,708 lbs. of wool, imported 230,911,473 lbs., exported of domestic wool 6,945,981 lbs., exported of foreign wool 6,028,236 lbs., retained for home consumption 490,939,256 lbs. The estimated product of the world in 1896 was, in lbs., Great Britain 135,000,000, European Continent 611,978,500, North America 289,474,708, Australasia 643,000,000, Cape of Good Hope 93,000,000, River Platte 329,000,000, other countries 345,649,792. See SUINT.

Wool, JOHN ELLIS, U.S.A., 1784–1869. Captain 1812, Col. 1816, Brig.-gen. 1841; prominent under Taylor at Buena Vista 1847; Major-gen. 1862. He saved Fort Monroe, Va., 1861.

Woolen Manufactures. Weaving of woolen fabrics was one of the earliest industries. Before the Reformation it was mostly domestic, employing the large spinning-wheel, reel and hand loom. The teasel for combing the nap is of an-

cient date. From 1300 to 1700 the manufacture was extensive in England, but the goods were coarse; the Spanish and Flemish goods were finer. The carding machine was used in England 1753, the spinning-jenny 1764, the power loom 1785, and Jacquard loom 1811. The first factory in U. S. was established 1794; before this the industry was domestic. The wool is first sorted as to fineness, length and texture, and then scoured with hot water and soap to remove dirt and fatty suint. It is now dyed if necessary. It is cleansed from seeds and burrs by a burring machine, picked to separate the matted portions, and oiled with oleic acid. It is now carded, spun and woven, the woolen yarns being less twisted than worsted yarns. The goods are scoured to remove oil, dyed if necessary, fulled in soap and water, washed, dried, the nap raised with teasels, sheared and pressed. The last three processes are not applied to flannels. Delaines have a cotton weft and woolen warp, and are printed like calicoes. Carpets are made from coarse wools. The value of the woolen manufactures in U. S. in 1890 amounted to $337,768,524, including woolen, worsted and felted goods, carpets, hosiery and knit goods, chiefly in Mass., Pa., N. Y., Conn. and R. I. The value of imported goods the same year was $56,582,432. See LOOM, SPINNING, SPINNING-JENNY, WEAVING, and YARN.

Woolf, BENJAMIN E., b.1836 in London. American critic, dramatist, and composer of comic operas. *The Mighty Dollar.*

Wool Fat. See SUINT.

Wool-Grass. See COTTON-GRASS.

Woollett, WILLIAM, 1735–1785. English engraver.

Woolman, JOHN, 1720–1772. American Quaker preacher. *Journal*, 1775, repub. 1871.

Woolner, THOMAS, 1826–1892. English sculptor and poet, R.A. 1874; one of the Pre-Raphaelites. *Pygmalion*, 1881; *Silenus*, 1884; *Tiresias*, 1886.

Woolpack Clouds. Small cirro-cumuli regularly arranged; so called from their resemblance to small fetches, bags or packs of white wool. Among the Sanskrit-speaking Aryans, the cumuli were personified as lambs or sheep.

Woolrych, HUMPHREY WILLIAM, 1795–1871. English writer on law; biographer of Coke, the Lord Chancellors, and Lord Jeffreys, 1826–27. *Serjeants at Law*, 1869.

Woolsack. Large square bag of wool without back or arms and covered with red cloth, which forms the seat of the Lord Chancellor of England, in the House of Lords.

Woolsey, MELANCHTON TAYLOR, U.S.N., 1782–1838. Captain 1816, Commodore 1832; active in the War of 1812.—His son, MELANCHTON BROOKS, U.S.N., 1817–1874, Captain 1866, Commodore 1871, served on the Atlantic Coast and in the Gulf 1861–65.

Woolsey, THEODORE DWIGHT, D.D., LL.D., 1801–1889. Prof. Yale 1831, pres. 1846–71; N. T. reviser 1871–81. *International Law*, 1860; *Divorce*, 1869; *Political Science*, 1877.—His son, THEODORE SALISBURY, b.1852, became Prof. of International Law at Yale 1878.—His cousin, SARAH CHAUNCEY ("SUSAN COOLIDGE"), b.ab.1845, has written much for children. *Verses*, 1880.

Woolson, ABBA LOUISA (GOOLD), b.1838. American writer. *Dress*, 1874.

Woolson, CONSTANCE FENIMORE, 1848–1894. American novelist of much ability, sympathy, and penetration; in Europe from 1879. *Anne*, 1882; *For the Major*, 1883; *East Angels*, 1886; *Jupiter Lights*, 1889; *Horace Chase*, 1894; *Dorothy*, 1895; *Mentone, Cairo, and Corfu*, 1896.

Woolsorter's Disease. ANTHRAX (q.v.).

Woolston, THOMAS, 1669–1732. English deist, imprisoned from 1729 for a work on N. T. miracles.

Woolwich. E. suburb of London, on the Thames; noted for its arsenal, begun 1585, and military academy, founded 1741. Pop., 1891, 40,848; of parliamentary borough, 98,976.

Woonsocket. City of Providence co., R. I., on Blackstone River; chartered 1867 and 1888. It has extensive cotton and woolen manufactures, and an excellent water power. Pop., 1890, 20,830.

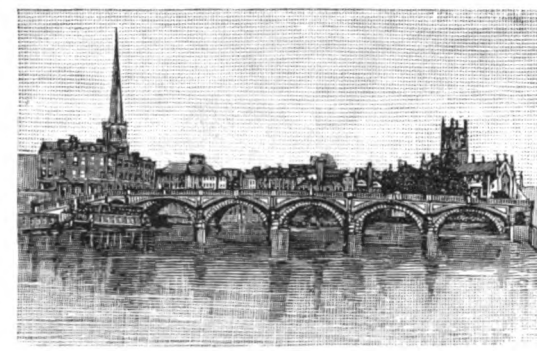
Woorali. See CURARA.

Wooster, DAVID, 1710–1777. Col. 3d Conn. 1755; Brig.-gen. 1758 and 1775; active in the French war and at Ticonderoga; killed at Danbury, Conn.—His grandson, CHARLES WHITING, 1785–1848, was a captain in the Chilian navy, and Rear-admiral 1829.

Wooster, UNIVERSITY OF. At Wooster, O.; opened 1870 under Presbyterian patronage; co-educational. It has 14 professors, 7 assistants, 378 collegiate and 145 preparatory students.

Wootten Fire-Box. Form of locomotive fire-box, introduced by J. E. Wootten for burning pea-coal, culm, or buckwheat coal. It has an area of 64 sq. ft., to secure low rates of combustion, and extends sidewise over the engine frame, so that the cab has to be put in front of it to avoid excessive overhang, and the two fire-doors are close to the coal supply in the tender. Such engines give large weights on the drivers for traction and work with economy of fuel. See COMBUSTION, FIRE-BOX, and LOCOMOTIVE.

Worcester. County town of Worcestershire, on the Severn; seat of a bishop since 679. It has varied manufac-



Worcester, from the Severn.

tures, and a cathedral, rebuilt from 1084, restored 1857 and later. Here Cromwell defeated Charles II. Sept. 3, 1651. Pop., 1891, 42,905.

Worcester. City of W. co., Mass.; important railroad center, with extensive manufactures, principally of boots and shoes and iron and steel; irregularly planned, owing in part to the hilly character of its site; incorporated 1722, chartered 1848; seat of Clark Univ. Pop., 1890, 84,655.

Worcester, EDWARD SOMERSET, MARQUIS OF, ab.1601–1667. Royalist, imprisoned 1645 and 1652–54; Marquis 1646; in exile 1648–52; student and inventor, apparently much in advance of his age. *A Century of Inventions*, 1663, includes the steam-engine, said to have been then applied for raising water at Vauxhall.

Worcester, JOSEPH EMERSON, LL.D, 1784–1865. American author of a *Gazetteer*, 1817, and other works, eminently the well-known *Dictionary of the English Language*, 1860.

Worcester, NOAH, D.D., 1758–1837. Unitarian controversialist; founder Mass. Peace Society 1815; ed. *Christian Disciple* 1813–18, and *Friend of Peace* 1819–29.—His brother, SAMUEL, 1770–1821, pub. *Letters to W. E. Channing*, 1815, and a much-used edition of Watts' hymns with Appendix, 1818.

Worcester Polytechnic Institute. At Worcester, Mass.; chartered 1865, opened 1868. It offers 4-year courses in mechanical, civil, and electrical engineering, chemistry, and general science. It has, 1897, 30 instructors and 221 students.

Word. 1. Logos; title given to Christ by St. John. 2. In popular (not biblical) language. Scripture, as a divine means of communication to men. See PHILOLOGY.

Worde, WYNKIN DE, d. after 1535. Caxton's helper and successor 1491; printer of 408 books; improver of the art, as in type-cutting and introduction of title-papes.

Worden, JOHN LORIMER, U.S.N., 1818–1897. Commander of the *Monitor* in her conflict with the *Merrimac*, March 9, 1862; Captain 1863, Commodore 1868; superintendent U. S. Naval Academy 1870–74; Rear-admiral 1872; retired 1886.

Wordsworth, CHRISTOPHER, 1774–1846. Brother of the poet; Master of Trinity Coll., Cambridge, 1820–41; compiler of *Christian Institutes*, 4 vols., 1837; *Ecclesiastical Biography*, 6 vols., 1810.—His son, CHARLES, D.D., D.C.L., 1806–1892, became Bp. of St. Andrews 1852. *Unity*, 1886; *Annals of my Life*, 1891–93.—His brother, CHRISTOPHER, D.D., 1807–1885, Archdeacon of Westminster 1865, Bp. of Lincoln 1868, edited the Greek N. T. 1856–60, and English *Bible with Notes*, 1864–70, and was a prolific author. *Theophilus Anglicanus*, 1843; *Inspiration of the Bible*, 1861. His *Holy Year*, 1862, contains some valuable and widely-used hymns.—His son, JOHN, D.D., b.1843, became Bp. of Salisbury 1885.

Wordsworth, WILLIAM, D.C.L., 1770–1850. English poet, resident in the Cumberland lake region—at Grasmere 1799–1813, and thenceforth at Rydal Mount; Poet Laureate 1843. His *Lyrical Ballads*, 1796, by their unpretentious simplicity, called forth much ridicule: a preface to the 2d edition, 1800, set forth his peculiar views. *The Prelude*, written 1799–1805, pub. 1850, is an autobiographic fragment in blank verse. *The Excursion*, 1814, is philosophic and descriptive. His later poems take a wider range of topics and style: some of them are among the

William Wordsworth.

noblest in the language. They are marked by deep love of nature and humanity, and by the "energetic and profound treatment of moral ideas." He had no sense of humor, no capability of lightness: no poet is more unequal. Popular recognition came to him slowly; but his influence on literature has been great, and chiefly in the way of liberation and uplifting.—His gifted sister, DOROTHY, 1771–1855, was an important element in his life, and a model of sympathy and devotion. *Journal in Scotland*, 1874.

Work. Result of producing some effect upon a body which is the subject of an applied force. As no effect is produced unless the point of application of the force moves, the work done is proportional not only to the magnitude of the force but to the distance through which it moves, or W=Fs. When work is done upon a body, it imparts to it an amount of energy which is exactly equal to the work done. The units of work are then the same as those of energy; viz., the foot-pound, foot-poundal, gram-centimeter, and erg.

Work, HENRY CLAY, 1832–1884. Conn. writer of war songs and other popular lyrics.

Working Stress. Stress that can be safely put on a member of a structure; equal to the ultimate strength divided by the assumed factor of safety. Thus, for timber in tension the ultimate strength is 10,000 lbs. per sq. in., but the working stress should be only ab. $\frac{1}{10}$ of this.

Work in Machines. Product of a force acting through a space. If the force acts through no path, as when a weight is supported, no work is done. The work is the same, if the product of path and force is constant, whether the force is large and path small, or the force small and path large. In any machine, the work of power and resistances are always equal to each other, over extended intervals.

Works, ADVANCED. See ADVANCED WORKS.

Works, DETACHED. See ADVANCED WORKS.

Works, FIELD. See FIELD WORKS.

Workshop Acts. See FACTORY LAWS.

World. See EARTH, SEA, and UNIVERSE.

World, POPULATION OF THE. Ernest Behm estimated this at 1,350,000,000 in 1866; 1,456,000,000 in 1880; 1,434,000,000 in 1882. This apparent loss of 22,000,000 in two years was due to greater accuracy in statistics. In connection with Herman Wagner, Behm edited *Population of the Earth*, 1872, and seven successive editions. In 1891 the eighth edition was prepared by Wagner and A. Supan, which estimates the population at 1,479,729,000, showing an increase of 45,729,000 since 1882, for which reasonably exact figures were obtained for 57 per cent. In 1880 actual census returns were obtained for only 44 per cent. Owing to the difficulties of obtaining accurate statistics, the estimate may be 75,000,000 at variance with the truth.

	Area, sq. m.	Population.	Pop. sq.m.
Europe (without Nova Zembla, Iceland and Atlantic Islands) . .	3,756,860	357,379,000	94
Asia (without the Polar islands) .	17,530,686	826,954,000	47
Africa (without Madagascar and other islands).	11,277,364	163,953,000	14
America (without the Polar regions)	14,801,402	121,713,000	8
Australia (with Tasmania) . . .	2,991,442	3,230,000	1
Oceanic Islands	733,120	7,420,000	10
Polar Regions.	1,730,810	80,000	—
	52,821,684	1,479,729,000	

World's Fairs. The chief international exhibitions have been those of London 1851 and 1862, Paris 1855, 1867, and 1878, Vienna 1873, Philadelphia 1876, Paris 1889, and Chicago 1893. See EXPOSITIONS, INTERNATIONAL.

Wormeley, KATHARINE PRESCOTT, b. 1832 in England. American translator of Balsac, 1886–97, and of Molière, 1895.

Wormley, THEODORE GEORGE. M.D., LL.D., 1826–1897. Prof. Columbus, O., 1852–77; Univ. Pa. 1877; writer on chemistry and toxicology.

Worms. Ancient town of Hesse-Darmstadt, on the Rhine; destroyed by Attila ab. 450; taken and burned by the French 1689, its cathedral, rebuilt ab. 1100, escaping. Many diets met here, especially that which heard Luther 1521; and here a treaty was signed Sept. 23, 1743, between England, Austria, and Sardinia.

Worms Cathedral.

Worms. See VERMES.

Wormseed. *Chenopodium anthelminticum.* Strong-smelling herb of the natural family *Chenopodiaceæ*, native of tropical America, widely distributed as a weed in temperate regions.

Wormseed Mustard. See MUSTARD, TREACLE.

Worm-Wheel. See SCREW-GEARING.

Wormwood. *Artemisia absinthium.* Bitter and aromatic perennial herb of the Composite family, native of Europe, cultivated and naturalized in waste grounds in America. The liqueur ABSINTHE (q.v.) is derived from it.

Wormwood (*Artemisia absinthium*).

Wormwood, ROMAN. See HOGWEED.

Wornum, RALPH NICHOLSON, 1812–1877. English art critic, Keeper and Sec. National Gallery from 1853. *Hist. Painting*, 1846; *Ornament*, 1856; *Epoch of Painting*, 1864; *Holbein*, 1867.

Worsaae, JENS JACOB ASMUSSEN, 1821–1885. Prof. Copenhagen 1854; Minister of Education 1874–75. *Antiquities of Denmark*, 1843, tr. 1849; *Danes in England*, 1851, tr. 1852; *Primitive History of the North*, 1881, tr. 1886.

Worship. Honor paid to a divine being; with Jews and heathens, largely in the form of sacrifices; among Christians, prayer and praise, spoken or sung, accompanied by Scripture-readings and sermons, and culminating in the Eucharist.

Worsley, PHILIP STANHOPE, 1832–1866. English poet; tr. Homer 1861–65.

Worsted. Thread spun of wool, which has been combed, and which, in spinning, has been twisted harder than ordinary. It is used for knitting and weaving.

Wörth. Village of Alsace; scene of defeat of the French under MacMahon by the Germans under the Crown Prince after a desperate and bloody battle lasting seven hours, Aug.

6, 1870. The French charged and broke the German lines eleven times, but lost 5,000 killed and wounded, and 55,000 prisoners. The German loss was ab. 8,000. Pop., 1890, 1,064.

Worth, CHARLES FREDERICK, 1825–1895. Ladies' tailor, b. in England, in Paris from 1846. His costumes long outranked all others.

Worth, JONATHAN, 1802–1869. N. C. legislator, opponent of nullification and secession; Gov. 1865–68.

Worth, WILLIAM JENKINS, U.S.A., 1794–1849. Captain 1814, Col. 1838, Brig.-gen. 1847; distinguished in the War of 1812, against the Seminoles in Fla. 1841–42, and especially at Monterey and in the later Mexican battles.

Worthen, AMOS HENRY, 1813–1888. Assistant on the Geological Survey of Ill. 1851, and of Ia. 1855; State Geologist of Ill. 1858–77; collector of Ill. fossils, and author of many reports and papers.

Worthen, WILLIAM EZRA, 1819–1897. Civil and hydraulic engineer; pres. Society of Civil Engineers 1887. *Drawing*, 1857–63; *Mechanics*, 1862.

Worthing. Fashionable watering-place in Sussex, Eng., 10 m. w. of Brighton. From its sheltered position, being encircled by the Downs on the n. and n. e., it has become a winter resort and a place for growing early fruits.

Worthington, HENRY ROSSITER, 1817–1880. American engineer and inventor, especially of pumps and pumping engines.

Worthington, THOMAS, 1773–1827. U. S. Senator 1803–7 and 1811–14; Gov. of Ohio 1814–18.

Wotton, SIR HENRY, 1568–1639. English poet, knighted 1604; Ambassador at Venice and elsewhere 1604–24; provost of Eton from 1625. His lyric, *Happy Life*, is famous. *Reliquiæ*, 1651.

Wotton, WILLIAM, D.D., 1666–1726. Precocious English scholar, prebendary of Sarum 1705–14. *Ancient and Modern Learning*, 1694.

Wounds. Breaks in the continuity of the soft parts caused by violence. Wounds may be classified as to their character as incised, where there is a cut from a sharp instrument; contused, when a blunt instrument bruises and breaks; punctured, when it is a stab from a pointed instrument; lacerated, where the tissues are torn. The treatment of wounds includes the stopping of hemorrhage, the cleansing, or rendering the wound aseptic, and the careful adjustment of the parts. In wounds of any severity, these requirements may be difficult to meet, and should be intrusted to trained hands.

Wouverman, PHILIP, 1619–1668. Dutch painter of cavalry combats, hunting scenes, and landscapes with equestrian figures; artist of great distinction.—His brothers, PIETER, 1623–1682, and JAN, 1629–1666, were less gifted.

Philip Wouverman.

Wouverman, SIMON VAN, 1690–1743. Flemish writer on the La. and W. India Companies. His works were pub. 1752.

Wrack. See SCUD.

Wrangel, FERDINAND, BARON VON, 1796–1870. Russian Arctic explorer 1820–24; Gov. of Alaska 1829–34; Rear-admiral 1837. *Journal*, tr. 1837; *Expedition*, tr. 1840.

Wrangel, FRIEDRICH HEINRICH ERNST, GRAF VON, 1784–1877. Prussian general 1823, Field-marshal 1856; commander against the Danes 1864.

Wrangel, KARL GUSTAF, COUNT, 1613–1676. Swedish general, commanding in sundry campaigns against Danes, Germans, and Poles.

Wrangel, KARL MAGNUS, D.D., 1730–1786. Overseer of Swedish congregations in and near Phila., Pa. 1759–68.

Wrangel Island. Island in the Arctic Ocean, n. of e. Siberia; sought by F. Wrangel, discovered by Long 1855, explored 1881.

Wrangler. One who takes honors in mathematical examinations at Univ. Cambridge. The highest on the list is Senior Wrangler.

Wrasse. See ACANTHOPTERI and LABRIDÆ.

Wratislaw, ALBERT HENRY, b.ab.1822. English translator of Bohemian poems and prose.

Wraxall, SIR NATHANIEL WILLIAM, 1751–1831. M.P. 1780, Baronet 1813; historical writer. His *Memoirs*, 5 vols., 1815–36, were repub. 1884.

Wray, J. See RAY, J.

Wreck. Property cast by the sea on to land. At common law it belonged to the crown, unless claimed by the owner within a year and a day; in the U. S., it is matter of State regulation. A vessel which becomes unnavigable at sea, requiring repairs more than half its value, is termed a wreck. See FLOTSAM, JETSAM, and LIGAN.

Wrede, KARL PHILIPP, 1767–1838. Bavarian general, who fought for the French 1805–12, and against them 1799–1800 and 1813–15; Count of the Empire 1809; defeated at Hanau 1813; Prince and Field-marshal 1815.

Wren, SIR CHRISTOPHER, LL.D., D.C.L., 1632–1723. Prof. of Astronomy at Oxford 1661; architect of St. Paul's, London, 1675–1710, and of many other notable buildings; knighted 1672; Pres. Royal Society 1680; M.P. 1689; Surveyor-gen. of repairs at Westminster Abbey 1698.

Wrens (*Troglodytes* and allied genera). Small dentirostral birds with short rounded wings, and short tail carried erect. The Wren family, *Troglodytidæ*, includes 60 species in the New World alone. *T. parvulus* is the common European wren. *T. hiemalis*, the White Wren of America, remains throughout the year, but *T. aëdon*, the House Wren, migrates in Oct. The latter is very variable in coloration.

Wrestling. Sport of marked antiquity, consisting of a contest between two individuals, each striving to throw the other to the ground. There are, however, forms of Japanese and Chinese wrestling in which the object is to force the opponent out of a set space. The principal varieties of modern wrestling are known as the Græco-Roman, where the hold is confined to the waist and above; the Collar and Elbow, which is sometimes wrestled in harness and in which the holds are as indicated in the name; and the Catch-as-catch-can, where any grip is permitted.

Japanese Wrestlers.

Wright, AMBROSE RANSOM, 1826–1872. Col. 3d Ga. 1861, Brig.-gen. C.S.A. 1862, Major-gen. 1864.

Wright, ARTHUR WILLIAMS, b.1836. Prof. of Physics at Yale 1872; author of many papers.

Wright, BENJAMIN, 1770–1842. Engineer of Erie and other canals.

Wright, BENJAMIN HALL, 1801–1881. American engineer, long in Cuba; introducer of steam on canal boats.

Wright, CARROLL DAVIDSON, b.1840. U. S. Commissioner of Labor 1885; prof. R. C. Univ., Washington, 1895. *Reports Mass. Bureau of Statistics of Labor*, 15 vols., 1873–88; *Census of Mass.* 1887–88; *Strikes*, 1887; *Industrial Evolution*, 1895.

Wright, CHARLES HENRY HAMILTON, D.D., b.1836. Dublin pastor; prolific writer. *Zachariah*, 1879; *Ecclesiastes*, 1883; *Introduction to O. T.*, 1891.

Wright, CHAUNCEY, 1830–1875. Mathematician of Cambridge, Mass., eminent in metaphysics. *Philosophical Discussions*. 1877.

Wright, ELIZUR, 1804–1885. American journalist, reformer, and writer on insurance. Tr. La Fontaine's *Fables* 1841.

Wright, FANNY, 1795–1852. Scottish-American lecturer and philanthropist; founder of a negro colony at Memphis, Tenn., 1827. She became Mme. d'Arusmont 1838. *Society in America*, 1821; *Free Inquiry*, 1829.

Wright, GEORGE, U.S.A., 1803–1865. Active in the Seminole and Mexican wars; Captain 1848, Col. 1855; Brig.-gen. U. S. Vols. 1861, commanding on the Pacific.

Wright, GEORGE FREDERICK, D.D., LL.D., b.1838. Prof. Oberlin since 1881; assistant 1881 on Pa. Geological Survey, where he traced the terminal moraine, as later through Ohio. His later work has been chiefly on Glacial Geology.

Wright, HENDRICK BRADLEY, 1808–1881. M.C. from Pa. 1853–55, 1861–63, and 1877–81. *Labor*, 1871.—His nephew, HARRISON, 1850–1885, was of note as an antiquarian.

Wright, HENRY CLARKE, 1797–1870. American lecturer and writer against war and slavery.

Wright, HORATIO GOVERNEUR, U.S.A., b.1820. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862–66, serving chiefly in Va.; Brig.-gen. and Chief of Engineers 1879–84.

Wright, SIR JAMES, ab.1714–1785. Chief-justice of S.C. 1760; Gov. of Ga. 1764–75 and 1779–83; Baronet 1772.

Wright, JOSEPH ("OF DERBY"), 1734–1797. English painter, mostly of portraits; noted for his use of artificial lights.

Wright, JOSEPH ALBERT, 1810–1867. M.C. 1843–45; Gov. of Ind. 1849–57; U. S. Minister to Prussia 1857–61 and from 1865; Senator 1862–63.

Wright, JOSEPH JEFFERSON BURR, M.D., 1800–1878. Surgeon U.S.A. 1833–76; active in the Mexican war, and in organizing hospitals 1861–62.

Wright, MARCUS JOSEPH, b.1831 in Tenn. Brig.-gen. C.S.A. 1862–65.

Wright, ROBERT, ab.1765–1826. U. S. Senator 1801–6; Gov. of Md. 1806–9; M.C. 1810–17 and 1821–23.

Wright, ROBERT EMMET, 1810–1886. Writer and editor of law-books. *Pa. Reports*, 14 vols., 1861–66.

Wright, SILAS, 1795–1847. M.C. 1827–29; Comptroller of N. Y. 1829–33; U. S. Senator 1833–44; Democratic leader. As Gov. of N. Y., 1844–46, he suppressed the anti-rent disturbances.

Wright, THOMAS, 1809–1884. Scottish paleontologist, active near Cheltenham, Eng.; describer of the Jurassic and Cretaceous *Echinodermata*.

Wright, THOMAS, 1810–1877. English antiquarian; editor of old texts, and prolific historical writer. *Biographia Literaria*, 1842–46; *Hist. Ireland*, 1848–52; *Uriconium*, 1872.

Wright, WILLIAM, 1794–1866. M. C. from N. J. 1843–47; U. S. Senator 1853–59 and from 1863.

Wright, WILLIAM, LL.D., 1830–1889. Prof. Dublin 1856, Cambridge 1870; editor of Arabic works.

Wright, WILLIAM ALDIS, b. ab.1836. English editor of Shakespeare, Bacon, and other texts.

Wrist. See CARPUS.

Wristdrop. Paralysis of the muscles of the forearm induced by lead poisoning.

Writ. Written mandate from a court to an officer.

Writer's Cramp. See NEUROSIS.

Writers to the Signet. Corporation of Scottish lawyers, who alone can draw up crown writs. Their privileges were formerly more extensive.

Writing. Art of recording ideas by the means of letters and characters formed on paper, parchment, stone, or other material. Pictures are considered to be the first essay toward writing. The most ancient remains of writing are upon hard substances, such as stones and metals, used by the ancients for edicts and matters of public notoriety. Hermes is said to have written a history of the Egyptians, and to have been the author of the hieroglyphics 2112 B.C. It is said to have been taught to the Latins by Europa 1494 B.C. Cadmus brought the Phœnician letters into Greece 1493 B.C. The commandments were written upon two tablets of stone 1491 B.C., according to Usher. The Greeks and Romans used wax table-books long before papyrus was known. See ALPHABET, CUNEIFORM WRITING, DIPLOMATICS, HIEROGLYPHICS, INSCRIPTIONS, PAPYRUS and RUNES.

Writing Machines. See TELEGRAPH and TYPEWRITER.

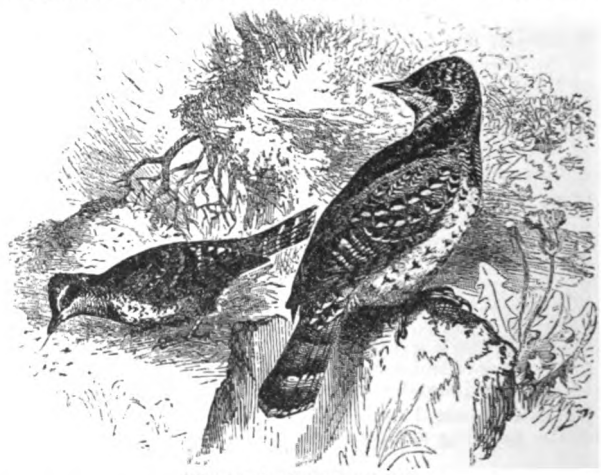
Wrongs. Violations or infractions of another's rights.

Wronskian. Determinant, based upon n functions of a single variable, whose elements are these functions and their successive differentials. Each column comprises one function and its successive differential coefficients: each row comprises the differential coefficients of the n functions of the same order.

Wrought-iron Pipe. One foot in length, having its interior diameter d inches and its exterior diameter D inches, will weigh 0 2614 (D—d)(D+d) lbs. For steel pipe add two per cent.

Wrought-Iron, STRENGTH OF. In both tension and compression, the average ultimate strength is ab. 50,000 lbs. per sq. inch. See STRENGTH OF MATERIALS.

Wry-Neck (JYNX). Bird of the Woodpecker family, but having soft tail feathers and nostrils partly hid by membrane. *J. torquilla* is widely distributed in the Old World; it is a little



Wry-Neck (*Jynx torquilla*).

larger than a sparrow, resembles a woodcock in coloration, feeds on ants, lays 6 to 10 eggs in holes in trees, and if these are taken will lay more up to 40. It is named from its habit of twisting its head and neck snake-like when alarmed.

Wuhu. Chinese treaty port since 1876, 55 m. s. e. of Nanking on an affluent of the Yang-tse-kiang, ab. 4 m. from the main stream. It is noted throughout China for its red cord; also for cutlery and other articles in steel. Pop. 100,000.

Wulfenite. $PbMoO_4$ Natural lead molybdate, tetragonal in crystallization, usually yellow, and found in association with other ores of lead.

Wulfram, ST., 650–720. Missionary to Frisia ab.684–689; Bp. of Sens 682.

Wulfstan, ab.1007–1095. Bp. of Worcester 1062; only prelate not displaced by William the Conqueror. Supposed author of part (from 1034) of the *Anglo-Saxon Chronicle*.

Wundt, WILHELM MAX, b.1832. Prof. Leipzig 1874; writer on physiology and psychology.

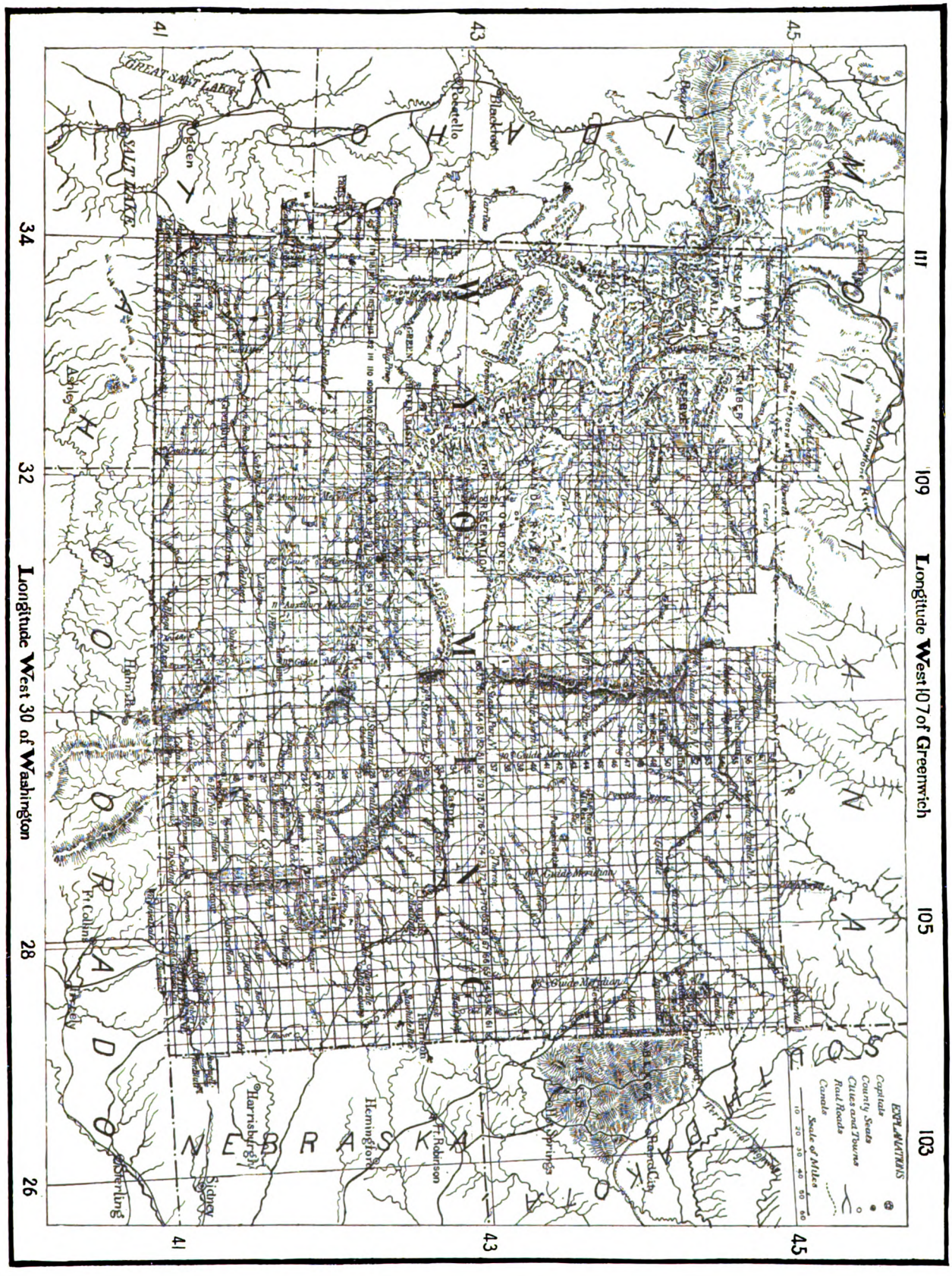
Wupper. River of Prussia, flowing past Barmen and Elberfeld and entering the Rhine below Cologne; not navigable; length 40 m.

Wurmser, DAGOBERT SIGMUND, GRAF VON, 1724–1797. Austrian general, defeated by Bonaparte in Italy 1796.

Wurtemburg. Kingdom of s.w. Germany, between Bavaria and Baden; area 7,529 sq. m.; held by Rome ab. 85–210; governed by counts 760–1495, then by dukes; much injured in the Thirty Years' War, and by French invasion 1688–92; made a kingdom by Napoleon 1806. It received a constitution 1819, sided with Austria 1866, bore part against France 1870, and became a portion of the German Empire. Capital, Stuttgart; pop., 1890, 2,036,522, mostly Protestants.

Wurtz, CHARLES ADOLPHE, 1817–1884. Prof. Paris 1854; Senator 1881. *Chemical Philosophy*, tr. 1867; *Dict. de Chimie*, 5 vols., 1868–78; *Atomic Theory*, tr. 1880.

EASTERN HEMISPHERE


111
109
Longitude West 107 of Greenwich
105
103
45
43
41
34
32
Longitude West 30 of Washington
28
26
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
GREAT SALT LAKE
SALT LAKE
Ogden
Pocatello
Blackfoot
Ashley
Hahn's Peak
Ft. Collins
Tassely
Sterling
Sidney
Harrisburg
Hemington
Ft. Robinson
Rapid City
Hot Springs
Yellowstone R.
Green R.
Bear R.
Platte R.
Cheyenne R.
Niobrara R.
Sioux Pass
Black Hills
Big Horn Mts.
Wind River Mts.
Uinta Mts.
Wasatch Mts.
Bear Lake
Utah Lake
Sevier Lake
Salt Lake
Great Salt Lake
Sweetwater R.
Sweetwater Mts.
Laramie Mts.
Medicine Bow Mts.
Sierra Madre
Ft. Laramie
Ft. Fetterman
Ft. Bridger
Ft. Douglas
Ft. Sanders
Ft. Steele
Ft. Washakie
Ft. Hall
Ft. Lemhi
Ft. Sheridan
Ft. Yellowstone
Ft. Mackenzie
Ft. Russell
Ft. Logan
Ft. Leavenworth
Ft. Riley
Ft. Hays
Ft. Dodge
Ft. Larned
Ft. Lyon
Ft. Garland
Ft. Reno
Ft. Sill
Ft. Cobb
Ft. Gibson
Ft. Smith

Wurtz, HENRY, b.1828. American chemist, author of many papers.

Wurtzite. ZnS. Mineral of the same chemical composition as sphalerite, but crystallizing in the hexagonal system.

Wurzburg. City of Bavaria, on the Main; ruled by its bishops till 1803; their palace dates from 1720–44; their small

Wurzburg.

coitage is abundant. The university, founded 1582, has ab. 75 teachers and 1,500 students, largely in medicine. Pop., 1890, 60,844.

Wuttke, HEINRICH, 1818–1876. Prof. Leipzig 1848; historian of Silesia 1842–47. *Entstehung der Schrift*, vol. i., 1872.

Wuttke, KARL FRIEDRICH ADOLF, 1819–1870. Prof. Berlin 1854, and Halle 1861. *Geschichte des Heidenthums*, 1852–53; *Christian Ethics*, 1860–62, tr. 1873.

Wyandots. Tribe connected with the Iroquois. A few remain in I. T. and Kan.

Wyant, ALEXANDER H., 1836–1892. American landscape painter. N. A. 1869.

Wyatt, SIR FRANCIS, ab.1575–1644. Gov. of Va. 1621–26 and 1639–42.

Wyatt, JAMES, 1746–1813. English architect, builder of Beckford's Fonthill Abbey, Wiltshire, Eng.

Wyatt, SIR MATTHEW DIGBY, 1820–1877. English architect, knighted 1869. *Industrial Arts*, 1851; *Metal-work*, 1852; *Fine Art*, 1870; *Note-book in Spain*, 1872.

Wyatt, RICHARD, 1795–1850. English sculptor.

Wyatt, SIR THOMAS, 1503–1542. English lyric poet, knighted 1536. His works, collected 1557, are largely sonnets and satires. —His son, SIR THOMAS, ab.1521–1554, rose against Queen Mary, and was beheaded.

Wycherley, WILLIAM, 1640–1715. English author of a few prose comedies, notable for wit and grossness, written ab.1659–71, produced 1672–77, pub. 1712. *The Plain Dealer*, 1665–77, is the best, and procured his release from prison and a pension 1686.

Wycliffe. See WICLIF.

Wycliffe College. At Toronto, Can.; theological school, founded 1779; affiliated with Toronto Univ.

Wye. Branch of the Severn, rising in Wales, and flowing 150 m. e. and s.; noted for beauty.

Wyeth, JOHN ALLAN, M.D., b.1845 in Ala. Prof. in New York 1881. *Surgery*, 1879–87.

Wyeth, NATHANIEL J., 1802–1856. Pioneer, in Oregon from 1835.

Wykeham. See WILLIAM OF WYKEHAM.

Wylie, JAMES AITKEN, LL.D., 1808–1890. Prof. Edinburgh Prot. Inst. from 1860; voluminous writer. *Hist. Protestanism*, 1874–77; *Hist. Scottish Nation*, 1886.

Wylie, ROBERT, 1839–1877. Anglo-American painter, in Brittany from 1864.

Wylie, SAMUEL BROWN, D.D., 1773–1852. Reformed Presb. pastor in Phila. from 1802, and prof. 1809–51. *Greek Grammar*, 1838; *Life of A. McLeod*, 1855.

Wyllys, GEORGE, ab.1570–1645. Gov. of Conn. 1642.—His grandson, GEORGE, 1710–1796, was Sec. of Conn. 1734–94.—His son, SAMUEL, 1739–1823, was Col. 1776–82, and Sec. of Conn. 1796–1809.

Wyman, JEFFRIES, M.D., 1814–1874. Prof. Harvard from 1847; pres. Boston Society of Natural History 1856–70; active investigator, and of high authority as a comparative anatomist; author of many papers.

Wyman, ROBERT HARRIS, U.S.N., 1822–1882. Commander 1862; active on the Atlantic coast; Captain 1866; chief hydrographer 1869–77; Commodore 1872, Rear-admiral 1878.

Wynants, JAN, ab.1615–ab.1680. Dutch landscape-painter.

Wynkin de Worde. See WORDE.

Wynkoop, HENRY, 1737–1816. In Congress from Pa. 1779–82; M.C. 1789–91.

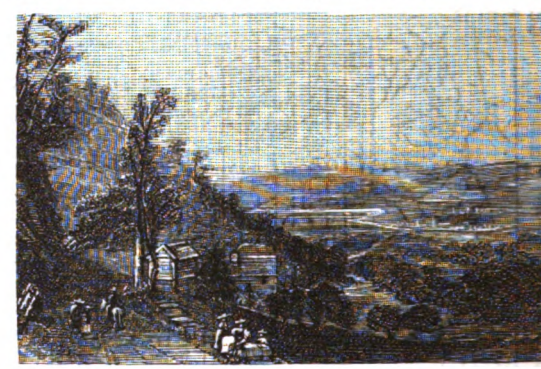
Wynn, RICHARD, ab.1750–1813. S. C. officer 1775–82; M.C. 1793–95 and 1809–13.

Wynne, EDWARD, 1734–1784. English lawyer. *Eunomus*, 1767.

Wyntoun, ANDREW OF, ab.1350–ab.1425. Scottish versifier. His *Orygynale Cronykil* extends to 1406, and was pub. 1795 and 1872–79.

Wyoming. State between Montana and Colorado, nearly rectangular; area 97,890 sq. m. The e. part consists of undulating plains. The central and s.w. portion is level and plateau-like; in the s. and n.w. are ranges of mountains, reaching altitudes of 14,000 ft. The average elevation is 6,400 ft. The climate is arid and subject to extremes of cold. The principal industries are cattle and sheep-raising and coal-mining, the latter mainly in the s.w. part. The capital is Cheyenne. W. was organized as a Territory 1868, and became a State 1890. Pop., 1890, 60,705. (See Map, page 1681.)

Wyoming Massacre. In Luzerne co., Pa., on the Susquehanna, near Wilkesbarre, July 3–5, 1778, by British, In-



Descent into Wyoming Valley.

dians, and Tories, who slew over 200; celebrated by Campbell in *Gertrude of Wyoming*. The region was settled ab.1762, and was claimed by Conn. till 1788.

Wyoming, UNIVERSITY OF. At Laramie; opened 1887. It comprises colleges of arts and of agriculture, a normal school, schools of mechanics and mines, and the State Experiment Station. It has 11 professors, 3 tutors, and 118 students.

Wyre Forest. In the n. e. of Worcestershire, Eng., forming the s. part of the Severn coalfield.

Wyss, JOHANN RUDOLF, 1781–1830. Prof. Berne 1806; ed. *Alpenrose*, 20 vols., 1811–30. His *Swiss Family Robinson*, 1812–13, is famous.

Wythe, GEORGE, LL.D., 1726–1806. Delegate to Congress 1775–76; signer of the Declaration of Independence; Va. judge 1777; law prof. at William and Mary Coll. 1779–89; Chancellor of Va. from 1786; member U. S. Constitutional Convention 1787.

Wyttenbach, DANIEL, 1746–1820. Prof. Amsterdam 1771, and Leyden 1799–1816; ed. of Plutarch's *Moralia* 1795–1830; biographer of Ruhnken 1800.—His wife, JOHANNA (GALLIEN), m.1818, d.1830, pub. *Théagène*, 1815, and *Alexis*, 1823.

Wyttenbach, THOMAS, D.D., 1472–1526. Swiss reformer, teacher of Zwingli; prof. Basel 1505, canon at Berne 1515, m.1524.

Wyvern. Fictitious monster, occurring in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

X

X, Axis of. Axis of abscissas in bilinear co-ordinates; so called because measurements on or parallel to it are indicated by X's. It is usually, though not necessarily, the first to be fixed, and is commonly drawn horizontally and made the initial line of the axial angle.

Xanthic Acid. $S{:}C{:}OC_2H_5.SH$. Oil with a bad odor; prepared by treating potassium xanthate with a mineral acid. Potassium xanthate is a beautiful colorless crystalline salt, very soluble in water. It is prepared by the action of alcoholic potash upon carbon disulphide, and used in cotton printing and as a vermicide.

Xanthine. $C_5H_4N_4O_2$. Xanthic oxide. Yellow coloring matter of several flowers; crystalline powder, formed by the action of nitrous acid upon guanine; it occurs in urinary calculi, pumpkin seeds, tea, and yeast.

Xanthochroi. Fair-skinned group of the Iranian or Caucasian race. The Greek, Slavonic, Romanic, Teutonic, Celtic and Scandinavian peoples are examples. More or less of a dark or melanochroic element has been introduced into the groups named, especially the Celtic and Romanic. See Man.

Xanthophyll. Yellow substance occurring in the cells of leaves, etc., to which is principally due the autumnal coloration of foliage; also known as Phylloxanthin.

Xanthoproteic Acid. Formed by the action of nitric acid upon albuminoid substances. The yellow substance which stains the fingers when nitric acid comes in contact with them. The stain turns an orange-red upon applying an alkali.

Xanthorhamnin. $C_{48}H_{66}O_{29}$(?). Yellow coloring matter obtained from Persian berries. It dyes fabrics, mordanted with iron-salts, black.

Xanthosiderite. $Fe_2O_3,2H_2O$. Variety of yellow ocher or bog ore, consisting of ferric oxide combined with ab. 18 per cent of water.

Xanthus. Ancient city of Lycia, s.w. Asia Minor; near the Mediterranean; taken by Persians 546 B.C.

Marble Monument in Xanthus.

Xantippe. Wife of Socrates; represented in tradition as of shrewish temper, but perhaps maligned.

Xavier, Francis, St., 1506–1552. Spanish Jesuit, most illustrious of Loyola's first associates 1534; missionary in India, Japan, and China from 1541; supposed author of the noble hymn, *O Deus, ego amo te;* canonized 1623; patron saint of India 1747.

Xebec. Small felucca-looking vessel, common to the Mediterranean Sea, carrying three masts with lateen, and sometimes square, sails.

Xenocrates, 396-314 B.C. Greek philosopher, successor of Speusippus 339 as head of the Academy at Athens. His writings are lost.

Xenogamy. Fertilization of flowers by pollen from others, borne on different plants.

Xenophanes, 6th cent. B.C. Greek philosopher and poet, founder of the Eleatic school and of philosophic monotheism; strong opponent of anthropomorphism. Fragments remain.

Xenophon, ab.444–ab.359 B.C. General in the service of Cyrus the Younger, who, after Cyrus' death at Cunaxa and the capture of the other commanders, led the 10,000 back to Greece. He left a number of works upon history, philosophy, and agriculture. The most celebrated are: the *Anabasis*, which recounts his own campaign in Persia, 401–399 B.C.; the *Hellenica*, which continues Thucydides' Greek history to the battle of Mantinea, 362 B.C.; the *Cyropædia*, and the *Memorabilia*, or memoirs of his master, Socrates. An adherent of Sparta, he was banished from Athens, and lived in Elis 387–371, and then at Corinth.

Xenotime. Y_2O_3,P_2O_5. Rare mineral, consisting essentially of yttrium phosphate, crystallizing in hexagonal forms and somewhat resembling zircon.

Xeres. See Jerez.

Xerez, Francisco de, 16th cent. Companion of Pizarro, and historian of the conquest of Peru.

Xerophilous. Plants especially adapted to growth in dry regions. Among the most characteristic are *Cacteæ*.

Xerxes, ab.519–465 B.C. King of Persia from 485 B.C. He started from Sardis to subjugate Greece 480; crossed the Hellespont by a bridge of boats, with an army said to number over

Ruins of Xerxes' Palace at Persepolis.

2,640,000, with as many attendants; was delayed at Thermopylæ by Leonidas and his Spartans; burned Athens; witnessed the defeat of his fleet at Salamis; and retreated. He was murdered by Artabanus.

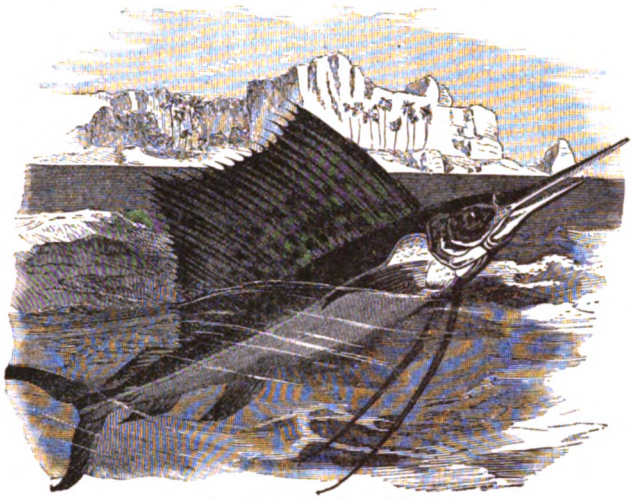
Ximenes de Cisneros, Francisco, 1436–1517. Spanish Franciscan 1482; Isabella's confessor 1492; Abp. of Toledo 1495; Chancellor of Castile and Grand Inquisitor 1505; Regent 1506 and 1516; Cardinal 1507; leader of an expedition against Barbary pirates 1508; persecutor of Moors and heretics; patron of learning; sincere ascetic and able statesman, wielding immense power with vigor and fanaticism.

Ximenes de Quesada. See Quesada, Gonzalo Ximenez de.

Xingu, or Chingu. River of Brazil, joining the Amazon near long. 52° W., rising in the Matto Grosso plateau, and flowing ab. 900 m. in a southern direction. It is full of rapids and falls except near its mouth.

Xiphias (Swordfish). Its upper jaw is produced into a sword-shaped organ, with which it is enabled to cut up many fish as they swim in schools, especially mackerel. Swordfish

are caught with harpoons. A single fish may attain a weight of eight hundred lbs. One or two million lbs. of this fish are



Swordfish (*Xiphias velifer*).

prepared for the market by the New England States annually. See ACANTHOPTERI.

Xiphisternum. Posterior end of the breast bone.

Xiphoid Whale. See ODONTOCETI.

Xiphosura. See PŒCILOPODA.

X-Rays. See ROENTGEN RAYS.

Xylem. Woody portion of a fibro-vascular bundle.

Xylem-Plate. Portion of xylem included between two medullary rays.

Xylenes. $C_6H_4(CH_3)_2$. Dimethylbenzenes; liquid hydrocarbons, known in three forms, all present in coal-tar, from which commercial xylene is prepared. Orthoxylene boils at 142° C., metaxylene at 137° C., and paraxylene at 137° C. They are used as solvents for rubber, and for making the xylidines.

Xylenols. $C_6H_3{:}{,}OH{,}(CH_3)_2$. Phenols derived from the xylenes; made by fusing the xylene sulphonic acids with caustic potash.

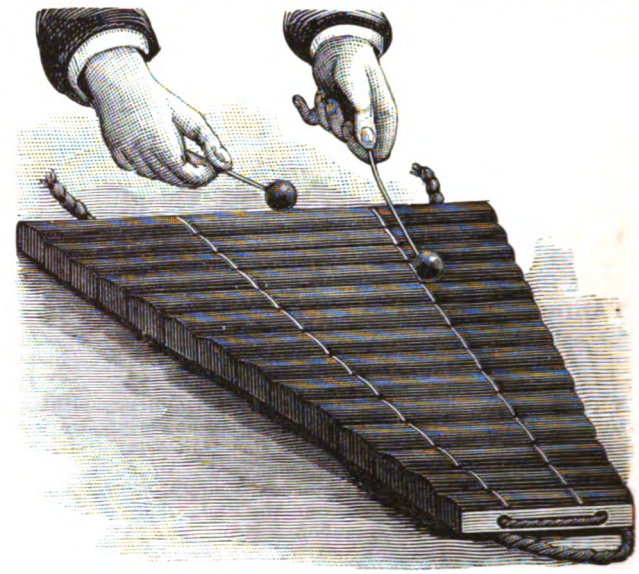
Xylidine Red. $C_{18}H_{14}N_2O_7S_2Na_2$. Sodium salt of the compound formed by the action of diazoxylidine upon β-naphtholdisulphonic acid; brown powder, soluble in water. It dyes wool red.

Xylidines. $C_6H_3 : NH_2.(CH_3)_2$. Bases prepared by the action of reducing agents upon the nitroxylenes. Six forms are known; five are liquids, one is a solid. They are used in the manufacture of coal-tar colors.

Xyloidin. $C_6H_8(NO)_2O_6$. Explosive product obtained by the action of nitric acid on starch; discovered by Braconnot 1832.—Also, some varieties of collodion prepared by the action of nitric acid on wood-cellulose.

Xylonite. See CELLULOID.

Xylophone. Musical instrument formed by suspending a series of strips of wood so that they are free to vibrate transversely when struck with a little wooden mallet. Each piece



Xylophone.

is of such dimensions as to sound with a known pitch. They are then arranged in a row, with the lowest notes at one end and the highest at the other. By striking the pieces in the proper order, melodies and other musical effects may be produced.

Xyridaceæ. Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 2 genera and 50 species, widely distributed throughout the warmer parts of the earth; called the Yellow-Eyed-Grass family.

Xysythrus, or XISUTHRUS. Name given by Berosus to the hero of the Deluge, in the Babylonian version of the story.

X. Y. Z. Correspondence. Name given to the dispatches of Marshall, Pinckney and Gerry, who were sent to France as commissioners 1797, which contained the insulting demands of Talleyrand and the other Directors. In the congressional copies X. Y. and Z. were substituted by President Adams for the names of Talleyrand's emissaries.

Y

Y, Axis of. Axis of ordinates in the bilinear systems; so called because measurements on or parallel to it are indicated by y's.

Yablonoi Mountains. Range of e. Siberia, offshoot from the great elevated region of central Asia, separating the basin of the Amoor from that of the Lena. Some peaks are 7,000 ft. high.

Yacht. Pleasure vessel, with more or less deck, with sail, steam, naphtha, electricity or other motive power, in size from the small sailboat up to the large steam-yacht 250 ft. in length. Of sailing boats the American Catboat is the simplest. It is a broad, shallow boat, with a centerboard, a single mast in the bow, with a large sail on a boom and gaff. The centerboard is made of wood or metal, pivoted at one end, and projects through the bottom of the boat on the center line, affording stiffness and retarding drift to the leeward; it was patented as a lee-board by Jacox Swain of N. J. 1811. The Sloop is of Dutch origin and usually has a centerboard. The Fin-keel has a fixed metallic fin attached to the keel. The Cutter is a keel boat, the name, however, applying to the rig; much used since 1885. These are all single-masted. Of two-masted vessels, the Yawl has sloop rig on the foremast and a triangular or sometimes a lug-sail on a smaller mast abaft the rudder-head. The Ketch has a higher mizzenmast than the yawl, set forward of the rudder-head, with a larger sail. The Topsail Ketch has a square sail on the mainmast. The Lugger has the sail on a yard, slung at the middle to the mast. The Sharpie has a flat bottom, a centerboard, triangular or leg-o'-mutton sails, extended by a sprit across the masts. The Cat-Yawl has a double-cat rig. The schooner rig is used on larger yachts, 60 ft. and upward in length.

Previous to the present century no time allowances were made in races of yachts of different sizes and area of sails. Subsequently, a modification of the Builders' Old Measurement tonnage was adopted, as the Thames rule, in Great Britain. This takes into consideration the length and breadth of the hull, the depth being considered to bear a fixed relation to the breadth. This led to the building of narrow, deep yachts with large keels of lead for stiffness and large sails, which competed equally with broader and shallower vessels and smaller sail areas, to the disadvantage of the latter. In 1880 it was proposed by Dixon Kamp to combine length of water-line with sail area in square feet in rating, and in 1887 the present rule was adopted as follows: $\frac{L \times SA}{6{,}000} = R$. This gave greater latitude in the modeling of yachts.

In U. S. the tonnage rule was not adopted, but various rules, involving displacement, sail area, deck length, etc., were in use from 1850. The yachts built were broad and shallow, with square ends. In 1882 the Seawanhaka-Corinthian Yacht Club of New York formulated a rule for rating yachts, based on water-line length and sail area, which was somewhat altered in 1883 and which has been adopted by American clubs. This is length of water-line plus square-root of sail area, divided by 2, $\frac{L + \sqrt{SA}}{2} = R$.

The change of rating rules has modified the form of yachts; moderate beam has been supplemented by great depth, not of hull proper, but of a portion of the hull, which may be regarded as a fixed centerboard or a fin-keel. The application of the wave-line theory has modified the water-lines of the boats, and the plans are now first worked out on paper by professional designers.

Yachts are built of wood, iron, or steel; also composite, wood and iron. Those of wood are sometimes sheathed with sheet copper. The "Vigilant" had a steel frame with Tobin-bronze plates. Previous to 1846 stone ballast was used; lead was then introduced. In 1870 lead keels were used; that of the "Galatea" weighed 78 tons.

The dimensions of a few yachts are appended:

1820.—80 tons, 55 ft. water-line, 18 ft. beam, 10 ft. draught.

1847.—American centerboard sloop "Maria," 92 ft. water-line, 26½ ft. beam, 5½ ft. draught, 7,890 sq. ft. sail area, besides a topsail.

1851.—American keel schooner "America," 170 tons, 83 ft. water-line, 22½ ft. beam, 11½ ft. draught.

1873.—English yawl "Florinda," 125 tons, 85¾ ft. water-line, 19½ ft. beam, 11¾ ft. draught, 54 tons ballast, 8 tons on keel.

1885.—English cutter "Galatea," 90 tons, 87 ft. water-line, 15 ft. beam, 13 ft. draught, 78 tons ballast on trough keel.

1891.—American cutter "Gloriana," 45 ft. water-line, 13 ft. beam, 10 ft. draught, 4,000 sq. ft. sail area.

1893.—American centerboard, fin-keel type yacht "Vigilant," 87 ft. water-line, 127 ft. over all, 26 ft. beam, 14 ft. draught, steel frame, Tobin-bronze plates, 11,312 sq. ft. sail area.

1893.—English cutter "Valkyrie II.," 86.8 ft. water-line, 23 ft. beam, 17½ ft. draught, composite build.

1895.—American cutter, fin-keel type, "Defender," 90 ft. water-line, 23 ft. beam, 19 ft. draught.

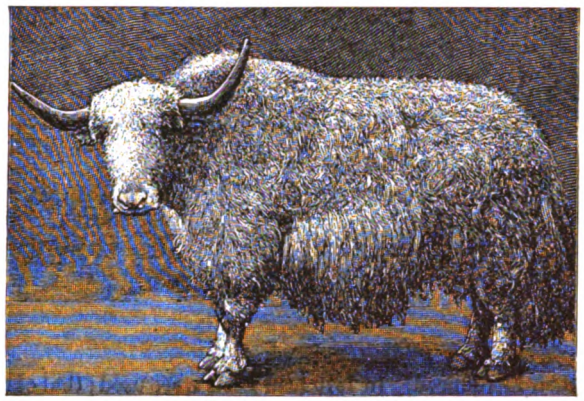
1895.—English cutter, fin-keel type, "Valkyrie III.," 90 ft. water-line, 26 ft. beam, 20 ft. draught.

See Cutter, Half-Rater, Ice-Boating, Schooner, and Sloop.

Yachting. Pleasure boats were used in early times. True yachting originated in the seventeenth century and became an established sport in the nineteenth century. Charles II. of England gave much attention to the sport, and the first recorded race was between this king and his brother, Duke of York, 1662. The first sailing club was the Cork Harbor Water Club founded 1720; the Yacht Club at Cowes, Isle of Wight, founded 1812, became the Royal Yacht Club 1817 and the Royal Yacht Squadron 1833. The first yacht club in U.S. was the New York Yacht Club, founded by John C. and Edwin Stevens 1844. In 1850 there were not more than five steam yachts afloat. In Lloyd's Yacht Register, 1891, there were recorded 6,179 vessels of all nations; Great Britain 2,428 sailing yachts, 59,795 tons, and 788 steam yachts, 78,000 tons; British colonies 253, mostly sailing, 7,193 tons; France 296 sailers, 6,358 tons, and 180 steamers, 10,020 tons; Germany and Austria 303 sailers, 3,070 tons, and 24 steamers, 2,825 tons; America 1,164 vessels In 1851 George Steers built the schooner yacht "America" for John C. Stevens, and five other members of the N.Y.Yacht Club. This yacht was a great advance both as to form and proportions of hull and flat set of sails. Aug. 22, 1851, this yacht won a race around the Isle of Wight, in a fleet of nine cutters and eight schooners, and won the Queen's Cup, offered by the Royal Yacht Squadron. In 1857 this cup was intrusted to the N. Y. Yacht Club for international competition. There have since been nine international contests for the America's Cup, the last in 1895 between the American boat "Defender" and the English boat "Valkyrie III.," both being keel cutters. The first race was won by the American boat, in the second the English boat was disqualified, and the third her owner refused to sail. The eight preceding contests were won by American yachts.

Yak (Bos, or Pœphagus grunniens). Species of *Bovidæ* of the highlands of central Asia, size of a small ox, and having long horns that curve outward, then forward, and at the tips turn backward. It has a heavy fringe or mane of hair that nearly reaches the ground, growing on the shoulders and sides and including the bushy tail. The wild Yaks keep within the snow line and range to 20,000 ft. elevation. Curiously, they are black, but the domesticated varieties are of various colors,

even white, or black with the mane white. They are useful for their milk and hair, and are trained for plowing and riding.



Yak (*Bos grunniens*).

Yakuts. Turkish tribes of the Lena valley of Siberia, numbering ab. 200,000. They have strong Mongolian features, and great powers of endurance, practice stock-raising, but are mainly nomadic hunters. They are nominally Christians, but polygamy prevails extensively.

Yakutsk. Capital of the province of Y. in e. Siberia, 1,800 m. n.e. of Irkutsk, on a left bank branch of the Lena, Khatystakh. It has a great fair from June 22 to Aug. 13 (new style) with returns amounting to ab. 2¼ million dollars. It was founded as a Cossack station 1632, and is now the center of the fish, tallow and fur trade of n. Siberia.

Yale, ELIHU, 1649–1721. Anglo-Indian merchant, b. in Mass.; benefactor 1715–21 of the college which took his name.

Yale, LINUS, 1821–1868. American inventor of combination locks.

Yale University. Chartered 1701 as the collegiate school of Conn.; in 1716 removed from Saybrook to New Haven; named Yale College 1718, taking the name of a liberal benefactor; rechartered 1745; title changed 1887. It is organized in four departments: Philosophy and Arts (including the scientific school), Theology, Medicine, and Law. The theological school was founded 1822; degrees in theology were first conferred 1867. The medical school, organized 1812, came under the complete control of the corporation 1884. The scientific school, begun 1847 as a school of chemistry, was endowed by J. E. Sheffield 1860, and received the income of Conn. "land-grant" college 1863–92. There are, 1897, 122 professors, 115 assistants, and 2,495 students, of whom 227 are graduates, 1,237 in the college proper, 553 in the scientific departments, 104 in divinity, 138 in medicine, and 213 in law: the library contains 200,000 vols., with special collections aggregating 45,000 more. Women are admitted to the courses for the Ph.D. degree, and to the school of fine arts, founded 1864.

Yam (*Dioscorea sativa*): *a*, a flower; *b*, root.

Yam. Vines of the genus *Dioscorea*, natural family *Dioscoreaceæ*, natives of India, bearing large, starchy roots; much cultivated in tropical countries as food-plants. The N. American *D. villosa* has also a large root.

Yama. Hindu god of the dead, and king of the infernal regions.

Yamagata, ARITOMO, MARQUIS, b. 1838. Japanese general and reformer; Premier 1889–91, Minister of Justice 1891–93; Count 1894, Marquis 1895; prominent in the war of 1894–95.

Yamaji, MOTOHARU, b. ab. 1840. Japanese general, active in the Satsuma rebellion 1877; in command at Port Arthur 1894; Viscount 1895.

Yamaska River. River of the province of Quebec, Canada, rising in Brome Lake and emptying into Lake St. Peter, an expansion of the St. Lawrence. Length 100 m.

Yana. River of Siberia, e. of the Lena, flowing ab. 1,000 m., mostly n., to the Arctic Ocean.

Yancey, WILLIAM LOWNDES, 1814–1863. M. C. from Ala. 1844–47; zealous promoter of secession; Commissioner to Europe 1861, Confederate Senator 1862.

Yangtse-Kiang. Largest river of China. It heads in the Niu Shan Mountains in n. Tibet, and after a very circuitous course of 3,200 m. flows into the Pacific. Drainage area ab. 690,000 sq. m.

Yankee. Inhabitant of New England; term now applied by Europeans to a resident of the U. S.

Yankee Doodle. English tune of uncertain origin, probably ab. 1750, popular in the U. S. since ab 1776; first printed in Samuel Arnold's Opera, *Two to One*, London, 1784. The words of the American song were written 1755 by Dr. Schuckburgh, a surgeon in the army of Gen. Amherst, in the French and Indian war. The etymology and history of the word *Yankee* are doubtful. See NATIONAL HYMNS.

Yantic River. Stream of Conn., affording large water-power and uniting with the Shetucket at Norwich and forming the Thames.

Yapura. See JAPURA.

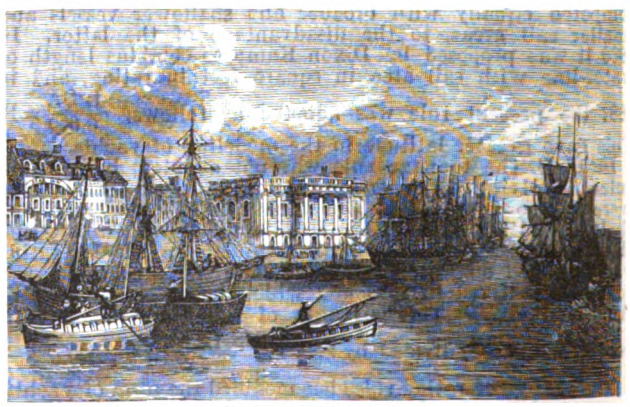
Yard. British standard of length or Imperial yard was fixed by act of Parliament 1855. It was enacted "that the straight line, or distance between the centers of the transverse lines, in the two gold plugs in the bronze bar deposited in the office of the Exchequer shall be the genuine standard yard at 62° F., and if lost it shall be replaced by means of its copies." This length is equal, as nearly as possible, to that of the best standards formerly used in England. Authorized copies have been deposited at the Royal Mint, under the care of the Royal Society, at the Observatory at Greenwich, and at the New Palace at Westminster. Should all these copies ever become unavailable, the standard yard can be reproduced from the length of a seconds pendulum which has been accurately determined at a station near London to be 99.413 cm., equal to 39.139 in. The yard is subdivided into three feet, and the foot into twelve inches. The American standard yard is a copy of the British, and is preserved in the Coast Survey Office, Washington, D.C.

Yard-Grass. See CRAB-GRASS.

Yards. Spars on which a vessel's sails are spread.

Yard's Off. Variety of Hide-and-Seek, in which the chaser stands at a certain spot where a stick is placed upon some support, and counts a certain number while the other players run off and conceal themselves. He then seeks them, and when he spies one calls out and runs to his yard. If he reaches it first, the player who has been discovered becomes a prisoner there; if the discovered one reaches it first, he throws it as far as he can and runs off again. The chaser must replace the stick or yard before he can resume his search for the others. At any time while he is searching, one of the hiders may rush in, and, reaching the yard, throw it, thus liberating all the prisoners who may have been caught. When all are discovered and made prisoners, the first one taken becomes the searcher.

Yarmouth. Town of Norfolk, Eng., on the Yare, near the North Sea; important from its herring fisheries. The estuary of the Yare, bordered on both sides by quays with a total length



The Quay, Yarmouth.

of 4 m., forms the harbor. It is one of the most frequented watering-places in Eng., having an excellent sandy beach and a handsome parade along the shore. Pop., 1891, 49,318.

Yarmuk. River of Syria; chief tributary of the Jordan, formed by the union of three head streams, one from the n. and two from the e. It enters the Jordan 4 m. below the Lake of Tiberias, and is the Hieromax of the ancient Greeks. Length 115 m.

Yarn. Spun thread, used in the weaving of cloth of different kinds. It varies in the material and the fineness to which it is spun. In order that uniformity may be insured, a pound of the material is taken as the standard, and this is divided into hanks or cuts. A hank of wool or cotton consists of 840 yards. A hank of linen yarn consists of 300 yards; and if it takes 25 of these hanks to make 1 pound: the yarn is called 25s. Grège yarn is spun of wool and silk, and combines the greatest strength with the utmost fineness.

Yaroslav, or JAROSLAV. Old town of Russia, on the Volga, 173 m. n.e. of Moscow. It has manufactures of linen, cotton, and silk. Pop., 1891, 80,336.

Yarrell, WILLIAM, 1784–1856. English zoölogist. *Hist. British Fishes*, 1835–36; *Birds*, 1839–43.

Yarriba. See YORUBA.

Yarrow. *Achillæa millefolium.* White-flowered herb of the Composite family, with finely dissected leaves; native of the n. hemisphere; frequently met as a wayside weed; known also as Milfoil.

Yarrow. Branch of the Ettrick, in s. Scotland; 25 m. long; celebrated by Scott, Wordsworth, and other poets.

Yassy. See JASSY.

Yates, EDMUND HODGSON, 1831–1894. Novelist; ed. London *World* from 1874. *Black Sheep*, 1866; *Recollections*, 1884.

Yates, JOSEPH CHRISTOPHER, 1768–1837. Judge N. Y. Supreme Court 1808–22; Gov. 1823–25.

Yates, RICHARD, 1818–1873. M.C. 1851–55: Gov. of Ill. 1860–64; U. S. Senator 1865–71. From him came U. S. Grant's commission as Colonel.

Yates, ROBERT, 1738–1801. Judge N. Y. Supreme Court 1776; Chief-justice 1790–98; member U. S. Constitutional Convention 1787.—His son, JOHN VAN NESS, 1779–1839, was N. Y. Sec. of State 1818–26, and pub. *Cases Adjudged*, 1811, and *Pleadings and Precedents*, 1837.

Yates, WILLIAM, D.D., 1792–1845. English Baptist, Missionary in India from 1815. *Sanskrit Grammar*, 1820, and *Dictionary*, 1846; *Hindustani Dictionary*, 1830.

Yavari. See JAVARY.

Yawl. Ship of war's boat, nearly of the same form as the pinnace, but smaller, and used to land men, etc. It is generally rowed with six oars.

Yawning. Modified respiratory movement which frequently accompanies a sensation of drowsiness. It consists of a deep inspiration drawn through a widely opened mouth, followed by a pronounced, often markedly audible, respiration.

Yaws. Contagious disease of the skin peculiar to the tropics. It is chronic in its nature, and characterized by dirty or bright red raspberry-like tubercles.

Yazoo Fraud. In 1795 Ga. sold some 35,000,000 acres to four companies for $200,000. The sale was soon nullified, and the lands ceded to the U. S. 1802; but purchasers brought suit, the U. S. Supreme Court decided in their favor 1810, and Congress voted $5,000,000 in 1814 to discharge these claims.

Yazoo River. In Miss., branch of the Mississippi, draining an extent of low, marshy, fertile land known as the Yazoo bottoms. Length 500 m., drainage area 13,936 sq. m., average flow 35,166 cu. ft. per sec.

Yeaman, GEORGE HELM, b.1829. M.C. from Ky. 1862–65; U. S. Minister to Denmark 1865–70. *Government*, 1870.

Yeamans, SIR JOHN, ab.1605–ab.1676. Leader of emigrants from Barbadoes to Carolina; Gov. 1665–67 and 1672–74.

Year and a Day. Period fixed by common law for various purposes; *e.g.*, one assaulted must die within such period, or the killing was not murder; the owner of a wreck or an estray must claim it within such period; execution on a judgment must issue within such time.

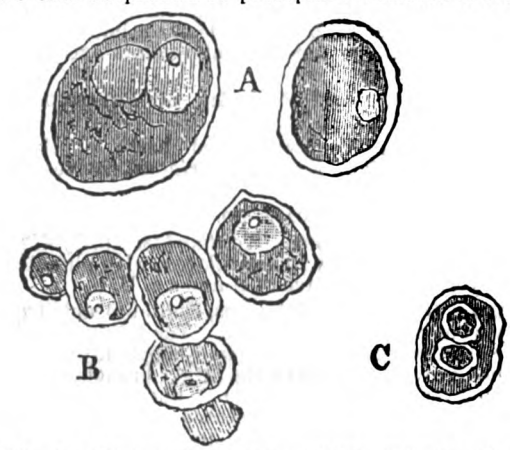
Year Books. Oldest English law reports, pub. annually. The first includes 1292–1307, in the reign of Edward I.

Yeardley, SIR GEORGE, ab.1580–1627. Gov. of Va. 1619–21 and 1626–27.

Year of Confusion. That preceding the adoption of the Julian Calendar, 45 B.C., when the beginning of the year was changed from March to January 1, making the year preceding 445 days in length.

Year of Release. In Israel, every seventh year, in which tillage was to be suspended and debts remitted. Only two are known to have been actually observed, 164–163 and 136–135 B.C.

Yeast. Minute unicellular plants of the class *Saccharomycetes*, which cause the vinous fermentation of saccharine fluids, breaking up the sugar into alcohol and carbon dioxide. Yeast cells are oval corpuscles of protoplasm inclosed in a cellulose



Bakers' and Brewers' Yeast (*S. cerevisiæ*) A, Single cell, one with two vacuoles; B, Chain of cells budding; C, Cell containing spores.

sac averaging $\frac{1}{2500}$ in. in diameter. They reproduce by buds, and under special conditions by endospores. There are 25 species. See BREAD, BEER, FERMENT, FERMENTATION, and WINE.

Yeast Powders. Mixtures of sodium bicarbonate with acid calcium phosphate, or with potassium bitartrate, or with burnt alum, in the form of powders, used as a substitute for yeast in leavening bread. They set free carbon dioxide.

Yeates, JASPER, 1745–1817. Judge Pa. Supreme Court from 1791. *Reports*, 1817–19.

Yeats, WILLIAM BUTLER, b.1865. Irish poet and novelist. *Secret Rose*, 1897.

Yedo. See TOKIO.

Yekaterinburg. See EKATERINBURG.

Yelk. See YOLK.

Yell, ARCHIBALD, 1797–1847. M.C. from Ark. 1835–39 and 1845–46; Gov. 1840–44; Col. 1846; killed at Buena Vista.

Yellata Falls. The last falls on the Congo, 25 m. above Viva and ab. 100 m. from its mouth.

Yellow-Cells, OF RADIOLARIA. Alga-like cells that apparently live parasitically or symbiotically (see SYMBIOSIS) in the outer layers of the protoplasm of Radiolarians.

Yellow Fever. Highly communicable fever of the subtropical regions, which formerly was occasionally epidemic further north in the late summer or early autumn. The poison of the disease is killed by frost. It is highly contagious, severe in its attack, and has a high mortality rate. It is dreaded in the Southern States, where it is frequently imported from the W. Indies or Central America. Sanitation can do much to prevent its spread, as has been demonstrated in several Southern cities where the introduction of a satisfactory sewage system and the employment of care in the prompt removal of garbage has prevented its spread in an epidemic form even when cases have been imported.

Yellow Fever Microbe. Prof. Giuseppe Sanarelli, an alumnus of the University of Siena, Italy, and Director of the Institute of Experimental Hygiene, Montevideo, Uruguay, in 1896 discovered the microbe of yellow fever, which he named *Bacillus Icteroides*. It has the form of a rod, with round ends, is .002—.004 mm. long and $\frac{1}{2}$ to $\frac{1}{3}$ this in diameter, and occurs in groups in the tissues and in pairs in cultures. It is an energetic poison and produces disease in most domestic animals excepting birds. It enters by every channel, even by respiration, and is found in the circulation and the tissues, effecting degeneration of the liver and uræmia. By repeated inoculation with the icteroid toxin, he has obtained serum, giving immunization, against experimental yellow fever, to animals. Injected into the thigh or forearm of man during the first period of yellow fever, it is fatal to the *Bacillus Icteroides*, but impotent against toxins produced by that microbe. Thus far it has been successful only in the early stages of the disease. The treatment is yet in the experimental stage.

Yellow Hammer (EMBERIZA CITRINELLA). Bunting found in Europe and w. Asia. It is fattened and eaten in Italy. The name is given to the flicker in the U. S.

Yellow Metal. See MUNTZ METAL.

Yellow Pigments. Yellow lakes, prepared from Persian

berries and quercitron bark are fugitive colors. Gamboge, and Indian yellow, prepared in India from camels' urine, are used in water-color painting, but have a tendency to fade. Ochers, cadmium yellow (cadmium sulphide), lemon yellow (barium chromate), and Naples yellow (basic lead antimoniate), are all permanent. All can be used as water-colors except the last named.

Yellow Prussiate of Potash. See POTASSIUM FERRO-CYANIDE.

Yellow-Rattle. Yellow-flowered herbs of the genus *Rhinanthus*, natural family *Scrophulariaceæ*, natives of cooler parts of n. temperate zone.

Yellow River. See HOANG-HO.

Yellow-Root, SHRUBBY. *Xanthorhiza apiifolia.* Low shrub of the natural family *Ranunculaceæ*, with pinnate leaves and a deep yellow root, native of e. and s.e. U. S.

Yellows. Disease of peach trees, communicable from tree to tree, by what means is not known. The foliage is yellowish green, the fruit is spotted red, the new shoots are stiff-leaved, and bunched growths appear on the larger branches. The tree dies in 3 to 6 years. The cause is not known and there is no cure. Some States require the diseased trees to be destroyed.

Yellow Sea. Arm of the Pacific, between China and Corea.

Yellowstone Lake. In the National Park; on the Yellowstone, near its head. Elevation 7,741 ft., area 130 sq. m.

Yellowstone National Park. Reservation in n.w. Wyo., which has been set apart from settlement by the U. S. government. Its area is 3,312 sq. m. It is a volcanic region, the fires of which have not yet been entirely extinguished. It contains the most extensive collection of hot springs (ab. 3,000) and geysers (71) in the known world. Its surface consists mainly of an elevated plateau ab. 8,000 ft. above sea level. Along its e. border extends a rugged range of mountains, whose highest peaks exceed 11,000 ft. In the n.w. another range enters the Park, and within its area are two groups of mountains 9,000 to 10,000 ft. in height. Nine-tenths of its area is covered with forests. Within it heads the Snake, which flows to the Columbia, and the Madison, Gallatin, and Yellowstone, which flow to the Missouri. Many of its streams have cut gorges in the volcanic plateau, the greatest of which is that of the Yellowstone, which has a depth of from 600 to 1,200 ft. and a length of 24 m. As hunting is prohibited in this area, it is rapidly becoming stocked with buffalo, elk, antelope, deer, and other wild game. It was first thoroughly explored 1870, and set apart by Congress as a public pleasure-ground 1872. It has several hotels connected by good roads.

The "Giant" Geyser.

Yellowstone River. Right-hand branch of the Missouri. It heads in n.w. Wyo., flows n. into Mont., then e. and n.e. to the border of N. D. Length ab. 1,300 m., drainage area 71,747 sq. m. It is navigable for small vessels at highwater to Livingston, Mont.

Yellow-Wood. *Cladrastis lutea.* Large white-flowered tree of the natural family *Leguminosæ*, with pinnate leaves and yellow wood, native of the s.e. U. S.

Yemen. S.w. province of Arabia, on the Red Sea. Area ab. 75,000 sq. m.

Yenesei. River of Siberia. It heads in the mountains bordering n. Mongolia, and flows n. ab. 3,200 m. to the Arctic Ocean. Drainage area 1,041,000 sq. m.

Yenesei, GULF OF. Inlet from the Arctic Ocean, in n.w. Siberia.

Yenikale, STRAITS OF. Body of water connecting the Sea of AZOV (q.v.) with the Black Sea. The s. part is called Strait of Kertch. Length 19 m., width 3 m.

Yeo, SIR JAMES LUCAS, R.N., 1782–1819. Captain 1809; active on Lake Ontario 1813–15.

Yeoman. Small farmer in England during the Mediæval and early modern period, holding land from the lord of the manor in fee simple, on lease at a money rent, or by copyhold, *i.e.*, at a customary rent with security of tenure.

Yeomanry. British volunteer force, formed 1797 as infantry, but cavalry since 1815; liable for home duty. They number ab. 12,000.

Yeomen of the Guard. Company of British veterans, formed 1485 as a bodyguard for the king or queen.

Yerkes Observatory. At Lake Geneva, Wis.: dedicated 1897 by C. T. Yerkes for Univ. Chicago. It possesses the largest refracting telescope in the world; object-glass 40 in. aperture, tube 62½ ft. long, focal distance 61 ft., cost of lens $100,000, cost of the whole $500,000.

Yesdigerd III., 617–651. Persian king 632. He was the last of the Sassanidæ. He warred with the Mussulmans, and was defeated at Cadesiah 636, and at Nehavend 641.

Yesso. See YEZO.

Yew. *Taxus baccata.* Evergreen shrub or tree of the Pine family, bearing red berry-like cones; native of the n. hemisphere. The east American yew is a low straggling bush, commonly called Ground Hemlock.

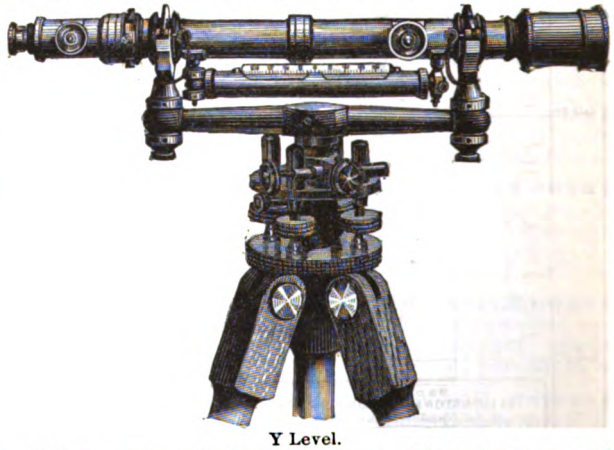
Yezd. Town of Persia 165 m. e.s.e. of Ispahan, situated in an oasis of mulberries in a sandy plain between two ranges of heights. The snow water from these hills is collected in underground reservoirs and used for irrigation. It is the center of the Persian silk industry, and contains nearly all of the 9,000 or so adherents of Zoroastrianism. Pop., 1870, 1,000,000.

Yezidis. Kurdish tribe near the Tigris, numbering some 200,000; worshipers of Satan, whom they regard as once chief in the creation, and to be hereafter restored.

Yezo, or YESSO. Second in size of the islands of Japan, lying n. of Nippon. Its surface is mountainous, and in the interior imperfectly known. Area ab. 30,000 sq. m.; pop., 1894, 339,445, including the remnant of the Ainos.

Yggdrasil. Ash-tree under which the Norse gods meet in council. Its three roots reach to Asgard, Niflheim, and the realm of Hela; beneath them springs up Mimir's Well, the well of wisdom.

Y Level, or WYE-LEVEL. Leveling instrument in which the telescope with its attached bubble rests in Y bearings, out of which it can be lifted and reversed. The telescope can be rotated at pleasure. It has been superseded to a certain extent by the DUMPY-LEVEL (q.v.).

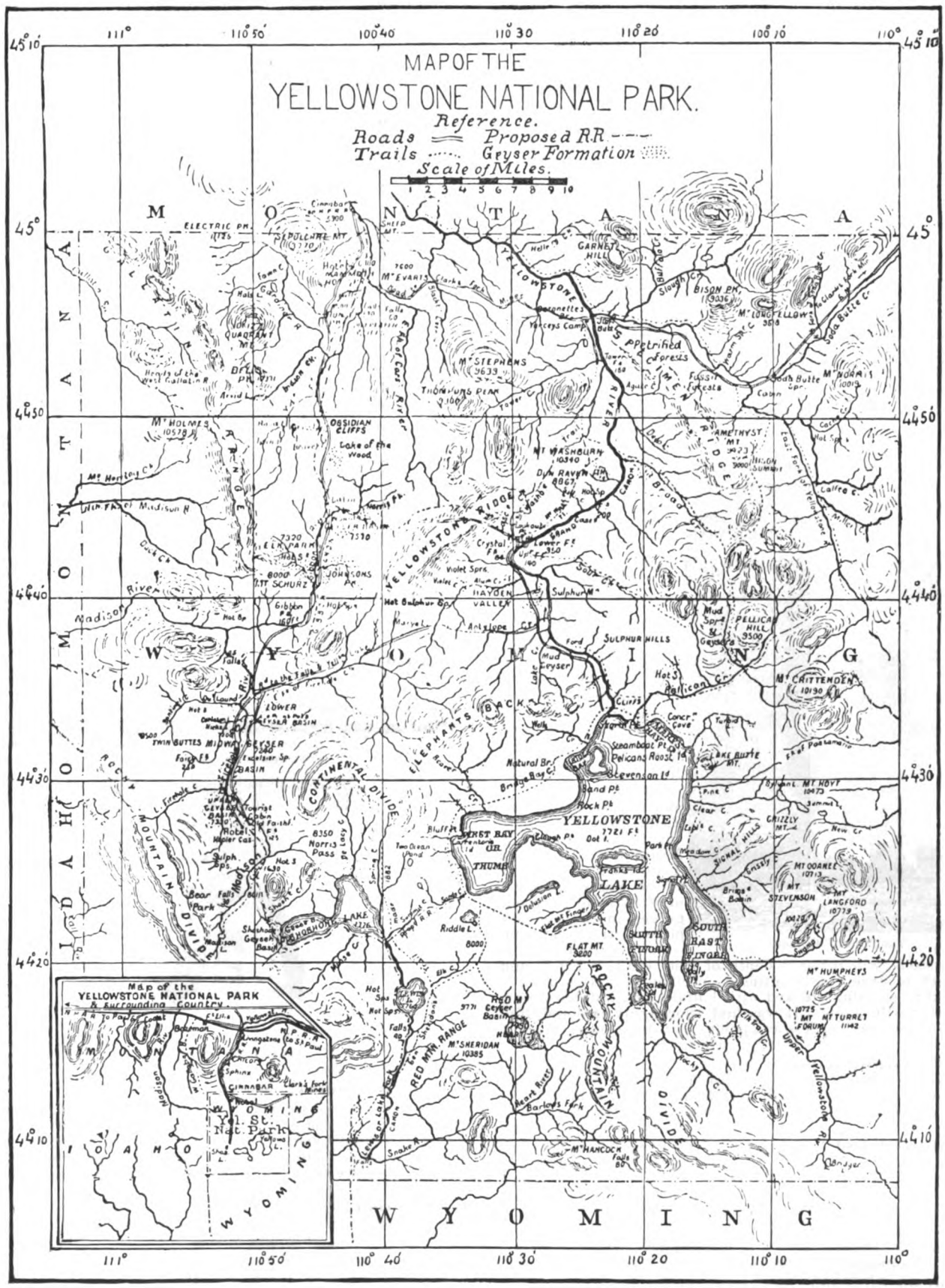

Y Level.

Yoga Philosophy. See YOGI.

Yogi. Hindu ascetic who practices the Yoga philosophy, one of the six orthodox systems of India. Such persons are believed to acquire supernatural powers and knowledge which leads to salvation. They live a mendicant life, professing absolute indifference to the world of sense, and devoted to contemplation.

Yokohama. Seaport of Japan, on the e. coast of Nippon; of recent development; headquarters of foreign commerce. Pop. ab. 165,000.

Yolk, or YELK. Food material stored up in the form of granules in egg cells, to feed the cells of the developing embryo. Hence the size of the egg is in relation to the amount of yolk, and this is in proportion to the complexity and size of the embryo at the time of hatching. The yolk itself is transformed chromatin granules, derived either from the egg nucleus or the nuclei of follicle cells. It is simply formed or plastic


MAP OF THE
YELLOWSTONE NATIONAL PARK.
Reference.
Roads
Proposed R.R.
Trails
Geyser Formation
Scale of Miles.
1 2 3 4 5 6 7 8 9 10
MONTANA
WYOMING
IDAHO
YELLOWSTONE LAKE
Petrified Forests
Mt. Washburn
Mt. Holmes
Mt. Evarts
Mt. Stephens
Mt. Norris
Mt. Chittenden
Mt. Humphreys
Mt. Sheridan
Mt. Hancock
Obsidian Cliffs
Lake of the Wood
Hayden Valley
Sulphur Hills
Pelican Hill
Amethyst Mt.
Garnet Hill
Bison Pk.
Mt. Long Fellows
Mt. Hoyt
Mt. Stevenson
Mt. Langford
Mt. Doane
Mt. Turret
Continental Divide
Rocky Mountain Divide
Red Mtn. Range
Elephants Back
Yellowstone River
Madison River
Gibbon R.
Firehole R.
Lower Geyser Basin
Midway Geyser Basin
Upper Geyser Basin
Norris Pass
Shoshone Lake
Riddle L.
Flat Mt.
Thumb
Dot L.
Frank L.
Delusion L.
Two Ocean Pond
Bear Park
Hot Springs
Red Mt. Geyser Basin
Map of the YELLOWSTONE NATIONAL PARK & surrounding Country.
Yel. St. Nat. Park
111° 110°50' 110°40' 110°30' 110°20' 110°10' 110°
45°10' 45° 44°50' 44°40' 44°30' 44°20' 44°10'

substance, and is not itself true protoplasm: hence it is called deuteroplasm. The so-called "yolk" of a hen's egg represents the entire original egg cell or ovum, greatly distended with yolk granules; the white is accessory albuminous food material, wrapped around the ovum after it leaves the ovary, and after it has been impregnated.

Yolk-Glands. See VITELLARIUM.

Yolk-Nucleus. Accessory nucleus present in eggs during their growth, and supposed to have the function of making yolk. It is not constantly present, and in many eggs the proper nucleus of the egg manufactures the yolk spheres. In other cases the investing cells of the ovum elaborate the yolk, which is absorbed by the ovum directly; sometimes entire cells or their nuclei may wander into the ovum, where they undergo degeneration and conversion into yolk. See PARANUCLEUS.

Yolk-Sac. Egg, or yolk of the egg, after it has been inclosed by epibole and the embryo developed as a definite structure upon it, so that a sharp demarcation exists between the yolk and the embryo.

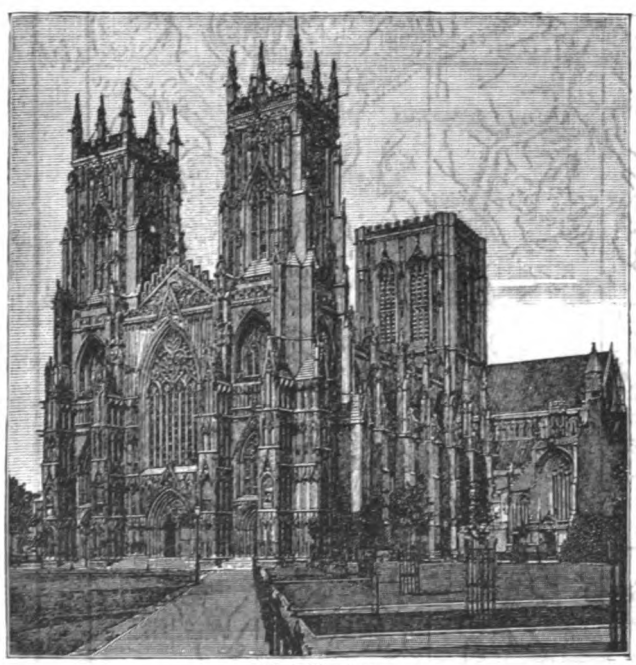
Yon, EDMOND CHARLES, 1841–1897. French etcher.

Yonge, CHARLOTTE MARY, b.1823. English novelist and historical writer, in the Ch. interest; author of some 120 vols.; ed. *Monthly Packet*. *Heir of Redclyffe*, 1853; *Landmarks of History*, 1852–57; *Daisy Chain*, 1856; *Golden Deeds*, 1864; *Book of Worthies*, 1869; *Life of Bp. Patteson*, 1873.

Yonkers. City of Westchester co., N. Y., on the e. bank of the Hudson, 18 m. n. of the Battery; suburb of New York; chartered 1855 and 1872. Pop., 1890, 32,033.

Yoritomo, MINAMOTO, 1146–1199. Shogun of Japan 1192; founder of its mediæval system.

York. Ancient city of Yorkshire, on the river Ouse; capital of Northumbria and Deira; destroyed by William I. 1068. Its noble minster dates mostly 1154–1400. The cathedral is in many respects the most remarkable of all English churches.



York Minster.

It measures 524½ ft. by 250 ft., with central tower 216 ft. high, and the western towers each 202 ft. It was completed as it now stands in 1472. Hadrian resided here in 120, and Severus died here 211. The castle, dating from Edward I., is an interesting object near the river, with Clifford's Tower. Pop., 1891, 66,984.

York. Capital of York co., Pa.; 28 m. s. of Harrisburg; founded 1741; chartered 1787 as a borough, 1887 as a city. It has some manufactures. Congress met here 1777–78. Pop., 1890, 20,793.

York, ARCHBISHOPRIC OF. Second to that of Canterbury, giving its incumbent third rank after the royal family; founded 634. It had Scottish jurisdiction till ab.1470.

York, CARDINAL. See STUART, HENRY B.

York, HOUSE OF. Richard, Duke of York, was descended on the female side from Lionel, Duke of Clarence, 3d son of Edward III., as also by his father from the 5th son of the same Edward; the house of Lancaster held the throne by descent from the 4th son of Edward III. The law of primogeniture favored York. To this line belong Edward IV. and V. and Richard III. The civil wars were ended, and the claims of the two rival houses to the throne merged, by the marriage of Elizabeth, eldest daughter of Edward IV., to Henry VII., his dangerous rivals being removed by execution. The badge of York was a white rose.

Yorke. See HARDWICKE, EARL OF.

Yorkshire. See SWINE.

Yorkshire College. See LEEDS.

Yorktown. Capital of York co., Va., on York River. Here Cornwallis, after a siege of ten days, surrendered to Washington Oct. 19, 1781. Magruder and Johnson, C.S.A., were besieged by McClellan April 5–May 4, 1862, and abandoned the town. Pop., 1890, 221.

York von Wartenburg, HANS DAVID LUDWIG, GRAF VON, 1759–1830. Prussian general 1807; leader in the revolt against Napoleon and alliance with Russia 1812–13; distinguished 1813–14; ennobled 1814; Field-marshal 1821.

Yoruba, or YARRIBA. Farming country of w. Africa, n.e. of Dahomey. Area ab.19,000 sq. m., pop. ab. 3,000,000.

Yosemite Valley. In the Sierra Nevada, Cal., ab. 6 m. long, a mile or less in width, and near a mile below neighboring level; surrounded by precipitous granite walls, 3,000 to 4,000 ft. high; supposed to be the work of a glacier; first known to whites 1851; controlled by State commissioners; greatly resorted to for its scenery. Its falls and rocks are especially famed.

You, DOMINIQUE, 1775–1830. Leader of La. pirates, pardoned for his services in the battle of New Orleans 1815, and thenceforth prominent in public affairs.

Youatt, WILLIAM, 1777–1847. English veterinarian and writer. *The Horse*, 1831; *Sheep*, 1832; *Cattle*, 1834; *The Dog*, 1842.

Youmans, EDWARD LIVINGSTON, M.D., 1821–1887. American writer on chemistry; founder International Scientific Series 1871, and *Popular Science Monthly* 1872. *Household Science*, 1857.—His sister and helper, ELIZA ANN, b.1826, has pub. several books on Botany.—His brother, WILLIAM JAY, M.D., b.1838, has continued his editorial work, and pub. *Pioneers of Science*, 1895.

Young, SIR ALLEN WILLIAM, R.N., b.1830. Arctic explorer, knighted 1877. *Two Voyages of the Pandora*, 1879.

Young, ANDREW WHITE, 1802–1877. American writer on government. *Political Hist. U. S.*, 1855–88.

Young, ARTHUR, 1741–1820. English farmer and author; Sec. to Board of Agriculture from 1793; ed. *Annals of Agriculture*, 1784–1801. His *Tour in Ireland*, 1780, and *Travels in France*, 1792–94, were repub. 1890–92; the latter is often quoted. His *Farmers' Kalendar*, 1771, was very widely circulated. A French tr. of his works, 1800–1, filled 20 vols.

Young, BRIGHAM, 1801–1877. Mormon elder 1832, apostle 1835, and pres. 1844; leader of the emigration from Nauvoo, Ill., to Utah; founder of Salt Lake City 1847, and of the State

Brigham Young.

of Deseret 1849; Gov. of Utah 1851–58; introducer of polygamy 1852; in conflict with U. S. authorities; husband of many wives, and gatherer of much wealth.

Young, CHARLES AUGUSTUS, LL.D., b.1834. Prof. Dartmouth 1866, and Princeton since 1877; inventor of an automatic spectroscope; measurer of the sun's rotation. *The Sun*, 1882; *Astronomy*, 1888.

Young, CHARLES MAYNE, 1777–1856. English actor, prominent in Shakespearian parts.—His son, JULIAN CHARLES, 1806–1873, wrote his *Memoir*, 1871, and *Last Leaves*, 1875.

Young, EDWARD, LL.D., 1684–1765. English didactic and satirical poet. *Love of Fame*, 1728. His *Night Thoughts*, 1742–46, were once very popular.

Young, JAMES, LL.D., F.R.S., 1811–1883. Scottish chemist, developer of paraffin oil from Scotch Boghead coal.

Young, JOHN, 1802–1852. M.C. 1836–37 and 1841–43; Gov. of N. Y. 1847.

Young, SIR JOHN, 1807–1876. M.P. 1831–55; Baronet 1848; Gov. of New S. Wales 1860–67; Gov.-gen. of Canada 1868–72; Baron Lisgar 1870.

Young, JOHN RUSSELL, b.1841 in Pa. Journalist; U. S. Minister to China 1882–85; librarian of Congress 1897. He accompanied Gen. Grant around the world 1877. *Around the World with Gen. Grant*, 2 vols., 1879.

Young, JONATHAN, U.S.N., 1825–1885. Captain 1873, Commodore 1882.

Young, PIERCE MANNING BUTLER, 1839–1896. Major-gen. C.S.A. 1864; M.C. from Ga. 1868–75.

Young, RICHARD MONTGOMERY, 1796–ab.1852. U. S. Senator 1837–39; Judge Ill. Supreme Court 1843–47.

Young, ROBERT, 1822–1888. Scottish printer and missionary. *Concordance*, 1880.

Young, THOMAS, F.R.S., 1773–1829. Prof. Royal Institution, London, 1801; physicist and Egyptologist. *Lectures*, 1807.

Young, THOMAS LOWRY, 1832–1888. Gov. of Ohio 1877; M.C. 1879–83.

Young, SIR WILLIAM, 1799–1887. Premier of Nova Scotia 1854 and 1860; Chief-justice 1860; knighted 1863.

Young, WILLIAM, 1809–1888. Anglo-American journalist; tr. Beranger 1850.

Young England. Name given to a band of young Tory politicians during the Corn-law struggle, 1842–45, who wished to revive the old kindly relations between the rich and poor. Among the foremost were Disraeli, C. Baillie, G. Smythe, and J. Manners. Disraeli, in his *Coningsby* and *Sybil* exposes their principles.

Young Ireland. Name given to the Revolutionary party in Ireland 1848, headed by G. Duffy and W. S. O'Brien.

Young Men's Christian Associations. Societies of Trinitarian Protestants, indifferent otherwise as to denomination, busy with various good works, and now of vast extension; organized first in London by G. Williams 1844; next at Montreal and at Boston 1851. They now number 1,430 in the U. S. and Canada, and 6,240 throughout the world. The American membership is 248,734.

Young People's Society of Christian Endeavor. See CHRISTIAN ENDEAVOR.

Young's Modulus. Force required to stretch a bar one inch sq. to double its original length, provided that it could be done without impairing the elasticity. It was introduced by Thos. Young 1805, and is now generally called the coefficient or modulus of elasticity.

Youngstown. Capital of Mahoning co., Ohio, on the Mahoning, 66 m. n.w. of Pittsburg; founded 1799. It has important iron manufactures. Pop., 1890, 33,220.

Young Women's Christian Associations. Organized in London 1855 and New York 1858, on plans similar to those of young men. They now number ab. 350 in the U. S., chiefly in colleges, with ab. 35,000 members.

Ypres (Flemish YPEREN). Fortified town of Belgium, 15 m. n.w. of Tourcoing, France. It contains many relics of the Middle Ages; in the 14th century it was noted for its manufacture of woolen goods and is supposed to have had a population of 200,000. Seat of a bishop from 1509–1801. Pop. 16,500.

Ypsilanti, ALEXANDER, 1725–1805. Hospodar of Wallachia and Moldavia; executed.—His son, CONSTANTINE, 1760–1816, held the same posts, rebelled against the Sultan, and ended his life in Russia.—His sons, ALEXANDER, 1792–1828, and DEMETRIUS, 1793–1832, fought against Napoleon and the Turks: the latter was Greek commander-in-chief 1828–31.

Yrarrazaval, MANUEL JOSÉ, 1836–1896. Chilian Senator and Premier.

Yriarte, CHARLES ÉMILE, b.1832. French author and journalist, of Spanish descent. *Venice*, 1879, tr. 1879; *Florence*, 1880, tr. 1882; *César Borgia*, 1889.

Yriarte, JUAN DE, 1702–1771. Librarian at Madrid 1732; poet. *Codices Gráeci MSS.*, 1769. *Obras*, 4 vols., 1774.—His nephew, TOMAS, 1750–1791, was a poet, dramatist, and translator. *La Musica*, 1780; *Fabulas*, 1782. *Obras*, 1787–1805.

Ysaye, EUGÈNE, b.1858. Belgian violinist, in America 1894 and 1898.

Yssel. Branch of the Rhine, separating from it near Arnhem in the Netherlands and emptying into Zuyder Zee. Length 80 m.

Ytterbium. Yb. At. wt. 173, sp. gr. 9.17, sp. ht. .0646, valence III.; discovered by Marignac 1878; rare metal, occurring in euxenite and gadolinite; white, infusible powder; salts are colorless.

Ytterbium Nitrate. $Yb(NO_3)_3$+aq. Large, clear, colorless crystals, obtained on treating the oxide with nitric acid, and crystallizing from water.

Yttrialite. Silicate containing large percentages of yttrium, thorium, and other rare chemical elements, found in Texas in association with other minerals of allied composition.

Yttrium. Y. At. wt. 89.1, valence III, IV; discovered by Gadolin 1798; rare metal, occurring in cerite, euxenite and gadolinite; it has not been prepared in the pure condition.

Yttrium Carbonate. $Y_2(CO_3)_3+3H_2O$. Gelatinous precipitate obtained on adding a solution of sodium carbonate to yttrium salts.

Yttrium Chloride. YCl_3+6H_2O. Colorless, hygroscopic, soluble prisms; made by dissolving the trioxide in hydrochloric acid and sal ammoniac, and then evaporating and crystallizing.

Yttrium Nitrate. $Y(NO_3)_3+6H_2O$. Large, transparent, easily soluble crystals; made by dissolving the oxide in nitric acid.

Yttrium Oxide. Y_2O_3. Yttria. Yellowish-white powder, obtained by heating the oxalate or hydroxide. When heated it emits a bright white light. Soluble in the common acids.

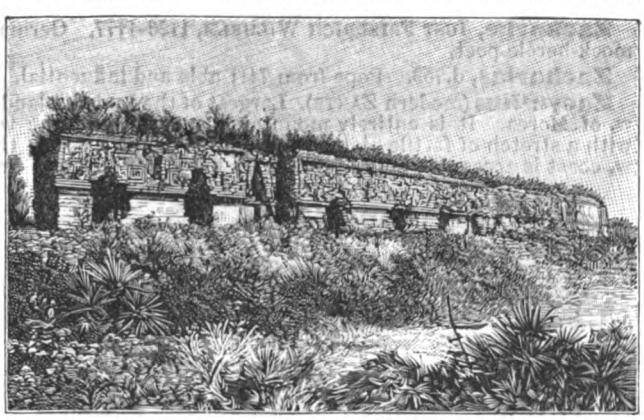
Yttrium Sulphate. $Y_2(SO_4)_3+8H_2O$. Sp. gr. 2.54; colorless, transparent, small, monoclinic crystals; made by treating the oxide with sulphuric acid and crystallizing from water.

Yttrocerite. Rare mineral, containing yttrium and cerium in connection with calcium fluoride; found in Sweden.

Yttrotantalite. Rare mineral, consisting essentially of yttrium tantalate or niobate with small admixtures of iron and other chemical elements; found in Sweden. A variety of the mineral fergusonite has been called by the same name.

Yuba River. In California, flowing through deep gorges in the Sierra Nevada, and emptying into Feather River below Y. City.

Yucatan. Peninsula projecting from Mexico and separating the Gulf of Mexico from the Caribbean Sea; first visited



The Governor's Palace—Ruins of Uxmal.

by Europeans 1517; part of Mexico, except for brief periods. The natives are Mayas. Ruins of Uxmal and other cities of unknown date have attracted much attention. See MAYA-QUICHE.

Yucatecs. Name often given to the inhabitants of Yucatan. See MAYA-QUICHE.

Yucca. See BEAR-GRASS.

Yukon. River which rises in the mountains of Northwest Territory, flows n.w. into Alaska, then w. and s.w. to its delta mouth in Bering Sea. Length ab. 2,050 m., drainage area ab. 205,600 sq. m. Its importance has been greatly increased by the development of gold-mining in the Klondike region 1897.

Yule. German festival in pagan times. Some of its appurtenances have passed over to Christmas. See YULE LOG.

Yule, SIR HENRY, LL.D., 1820–1889. Scottish engineer, in India 1840–62. *Cathay*, 1866; *Book of Marco Polo*, 1871; *Anglo-Indian Glossary*, 1886.

Yulee, DAVID LEVY, 1811–1886. M.C. from Fla. 1841–45; U. S. Senator 1845–51 and 1855–61.

Yule Log. Still burned in parts of England and the Continent at Christmastide. The usage is a survival from the old festival of the revival of the sun after the winter solstice. Magical properties are attributed to the Yule Log, which is believed to bring good luck. It is a widespread custom to keep part of the old log to light the new one the following year. In n. Italy the charred log is regarded as a protection against lightning.

Yuncas. Native tribes of the coast of Peru, who have now become merged in the general population. In the vicinity of Lima there are many ruins attributable to this people, the most extensive being at Caxamarquilla, ab. 15 m. from Lima and near Truxillo.

Yun-ho, or YUN-LIANG-HO. Chinese name of the Grand and Imperial Canal. It runs from Hangchou to Tientsin, ab. 700 m.; constructed in the first part of the 7th century primarily for the conveyance of the tribute of rice from the s. provinces. It is still an important means of communication between the n. and s. in the e. plain, though the section n. from the Hwang-ho to the Yu-ho has been dry since ab.1852.

Yupanqui, ab.1380–ab.1440. Ninth Inca sovereign of Peru. He assumed the government ab.1400, conquered the Chancas, and annexed their territory. At his death the Inca Empire embraced nearly all the territory of what is now Peru.

Yuruari. River of Venezuela, rising to the e. of the valley of the Caroni, flowing e. till it joins the Cuyuni in ab. 61½° W. long. Its valley contains valuable gold mines.

Yuste. Village of Spain 28 m. e. of Plasencia, on the slopes of the Sierra de Vera. It has ruins of a famous Hieronymite monastery, where Charles V. spent the last 18 months of his life and died Sept. 21, 1558.

Yusuf-ben Taxfyn, d.1106. Emir of Morocco; victor over Alfonso VI. of Castile 1086; usurper in Cordova, Grenada, and other kingdoms of s. Spain.

Yver de Chazelles, JEAN PIERRE, 1709–1786. French naval officer and Arctic explorer. *Voyage*, 1752–53; *Mexico*, 1778.

Yves d'Evreux, PIERRE, ab.1575–ab.1625. French Capuchin, missionary to Brazil 1611–14. His *Voyage*, 1615, was repub. 1864.

Yvetot. Town of n. France, 24 m. n.w. of Rouen. Till 1681 its lords were entitled king, as in a familiar song of Beranger.

Yvon, ADOLPHE, 1817–1893. French painter.

Y'ylang-Y'ylang. See IHLANG-IHLANG.

Z

Zabism, or SABISM. System of pagan philosophy, containing Gnostic and Neoplatonic elements, chiefly in Syria ab. 800–1200.

Zabriskie, ABRAHAM OOTHOUT, 1807–1873. Chancellor of N. J. 1866–72.

Zacatecas. Capital of the state of Z. in central Mexico, in a silver mining region; founded ab.1540. Elevation 8,000 ft., pop. ab. 60,000. The state has an area of 25,229 sq. m.; pop., 1893, ab. 486,000.

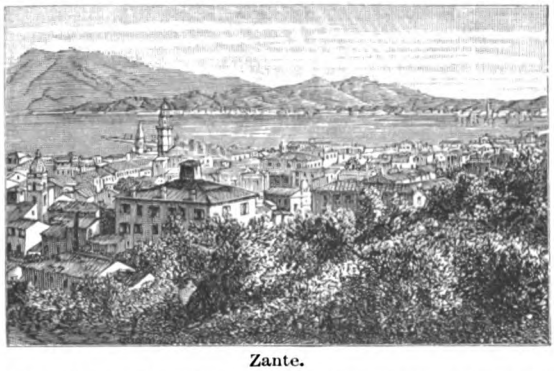
Zach, FRANZ, FREIHERR VON, 1754–1832. Hungarian-German astronomer.

Zacchæus. Jewish taxgatherer at Jericho, whose curiosity to see Jesus passing through Jericho led to his conversion. Luke xix. 1–10.

Zachariæ, JUST FRIEDRICH WILHELM, 1726–1777. German mock-heroic poet.

Zacharias, d.752. Pope from 741; able and influential.

Zacynthus (modern ZANTE). Largest of the Ionian Islands; w. of Morea. It is entirely mountainous or hilly in the w., with a stretch of fertile plains running n.e. to the s. coast; the w. coast is accessible only in summer; noted for its vines and



Zante.

currants, which were introduced in the middle of the 15th and 16th centuries respectively. This island is one of the parts of Greece most subject to earthquakes. Zante, on the e. coast, is the seaport town. Area 166 sq. m.; pop., 1889, ab. 44,000.

Zadkiel (RICHARD JAMES MORRISON), ab.1794–1874. Author of an astrological almanac, issued from 1830. The name had been assumed by Wm. Lilly, 1602–1681.

Zadok. High priest under David with Abiathar, who was deposed by Solomon.

Zaffarines. Three islets off the n. coast of Morocco, in the Mediterranean, 7 m. n.w. of the mouth of the Muluya; known from ancient times as a protection to ships. Spain, who owns them, has fortified them as outworks for Melilla.

Zaffre. Residue obtained in roasting cobalt ores. Ground up with various substances, it is used for painting porcelain blue.

Zagros Mountains. Between ancient Media and Assyria; general name for the mountain systems of w. Persia.

Zahn, THOEDOR. D.D., b.1838. Prof. Göttingen 1871, Erlangen 1878 and 1891, Leipzig 1888–91. *Cyprian*, 1882; *Hist. N. T. Canon*, 1888–91.

Zaldivar, RAFAEL, b. ab.1830. Pres. Salvador 1876–85.

Zaleucus, 7th cent. B.C. Greek lawgiver of Locri.

Zalinski, EDMUND LOUIS GRAY, b.1849 in Poland. Lieut. U.S.A. 1866, Captain 1887; developer of the pneumatic dynamite torpedo-gun and other military devices; writer on ordnance.

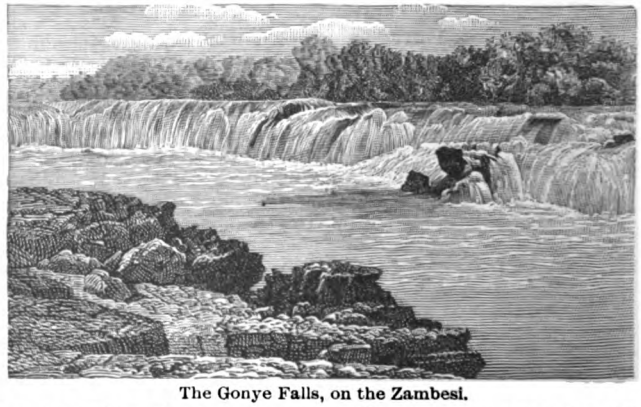
Zaluski, JOSEF ANDREI, 1702–1774. Bp. of Kieff; banished 1767–73; Polish bibliographer and collector. *Leges Poloniæ*, 1732; *Specimen hist. Polonicæ criticæ*, 1733.

Zama. Fortified city in Numidia, where Scipio defeated Hannibal and ended the 2d Punic war 202 B. C.

Zamacois, EDUARDO, 1842–1871. Spanish genre painter. Fine colorist and brilliant designer. *Education of a Prince*, 1870.

Zambeccari, FRANCESCO, COUNT, 1756–1812. Italian aëronaut.

Zambesi. River of s. Africa. Rises in lat. 12° S., flows s.e., n.e., e., and finally s.e. to the Indian Ocean. Owing to the



The Gonye Falls, on the Zambesi.

great number of cataracts and rapids in its upper and middle course (cataracts of Gonye, Katima, Mololo, Victoria Falls,

Kebrabasa Rapids) the greater part of the Z. is unfit for navigation. Length ab. 1,550 m., area of basin ab. 550,000 sq. m.

Zambesians. See ZAMBESI TRIBES.

Zambesi Tribes. The principal are the SUAHILI (q.v.) and the Mashona. The latter are agriculturists, and work iron ornaments. They are enervated and great beggars.

Zamboni's Pile. See DRY PILES.

Zambrana, RAMON, 1817–1866. Cuban medical writer.

Zamoiski, JAN, 1541–1605. Polish statesman, soldier, author, and king-maker. *De Senatu Romano*, 1563.—His descendant, ANDREI, 1716–1792, was Chancellor 1764, and framer of a code adopted 1791.

Zampieri. See DOMENICHINO.

Zamzummim. Aboriginal race, exterminated or reduced by the Hebrew and Arab tribes.

Zanchi, HIERONYMUS, 1516–1590. Italian reformer and polemic, prof. Strasburg 1553 and Heidelberg 1568. *Spiritual Marriage*, tr. 1592; *Christian Religion*, tr. 1659. *Works*, 8 vols., 1613.

Zane, EBENEZER, 1747–1811. Founder of Wheeling, W. Va., 1793; builder of Fort Henry there 1774, and its defender when besieged by Indians 1777, 1781 and 1782. In one of these sieges his sister, ELIZABETH, ab.1759–1847, rendered heroic service.

Zanella, GIACOMO, 1820–1888. Italian lyric poet and critic, his prof. Padua 1866–72. *Della letteratura Italiana*, 1885.

Zanesville. Capital of Muskingum co., and of Ohio 1810–12; on the Muskingum; founded 1799 by Col. E. Zane; chartered 1814 and 1869; in a coal region. It has varied manufactures. Pop., 1890, 21,009.

Zanguebar. See ZANZIBAR.

Zangwill, ISRAEL, b.1865. English novelist and critic. *Children of the Ghetto*, 1892; *King of Schnorrers*, 1894; *The Master*, 1895; *Big Bow Mystery*, 1895.—His brother, LOUIS, b.1867, pub. *A Drama in Dutch*, 1896.

Zannichelli, GIAN GIROLAMO, 1662–1729. Apothecary in Venice. *Istoria della piante che nascono nè lidi intorno a Venezia*, 1735.

Zante. See ZACYNTHUS.

Zanzibar. Region of e. Africa, on the coast, from ab. 2° N. lat. to 10° 40′ S.; long dependent on Muscat; now chiefly a British protectorate, the s. part being German. Area ab. 12,000

Zanzibar.

sq. m. on the mainland, and 1,200 in several islands, held by Britain. The chief of these, Z., includes 625 sq. m.; pop. ab. 150,000, mostly at the capital.

Zapata, JUAN ORTIZ DE, ab.1620–1690. Jesuit missionary in Mexico; historical writer.

Zapiola, JOSÉ, 1802–1885. Chilian musical conductor and composer.

Zapolya, STEPHEN, d.1499. Hungarian general, voivode of Transylvania.—His son, JOHANN I., 1487–1540, contested the throne from 1527 with Ferdinand of Austria.—His son and successor, JOHANN II., 1540–1571, established Protestantism 1555.

Zapotecs. Aboriginal Mexicans of the Isthmus of Tehuantepec and southward. They built temples and pyramids, whose ruins may still be found. The temple at Mitla had its four walls built leaning outward, so that it resembles an inverted truncated pyramid. The modern Indians of this region are handsome, industrious agriculturists, and well clothed. Their women have much influence.

Zappi, GIANBATTISTA FELICE, 1667–1719. Italian lyric poet.

Zaragoza, IGNACIO, 1829–1862. Mexican general; Sec. of War 1861; defender of Puebla against the French 1862.

Zarate, AGOSTIN DE, ab.1493–ab.1560. Historian of the conquest of Peru 1555.

Zarate, GIL, 1796–1861. Spanish dramatist. *Rosamunda.*

Zaratite. See EMERALD NICKEL.

Zarco, FRANCISCO, 1829–1869. Mexican journalist.

Zarephath, or SAREPTA. Phœnician town, n. of Tyre; refuge of Elijah. I. Kings xvii.

Zaritzin. See TSARITZIN.

Zarlino, GIOSEFFO, 1517–1590. Italian musical theoretician and composer. *Istituzioni harmoniche*, 1558; *Dimostrazioni harmoniche*, 1571; *Sopplimenti musicali*, 1588.

Zarncke, FRIEDRICH, 1825–1891. Prof. Leipzig 1853; ed. *Litterarisches Centralblatt* from 1851; ed. Brant's *Narrenschiff*, 1854, and other old texts; historian of Leipzig and the older universities.

Zavala, JOAQUIN, b. ab.1839. Pres. of Nicaragua 1879–83.

Zavala, LORENZO DE, 1788–1836. Mexican Senator and Minister. *Revoluciones, 1808–30*, 1831.

Zea, FRANCISCO ANTONIO, 1770–1822. Colombian patriot and botanist, in exile 1795–1815; then with Bolivar; Vice-pres. 1819.

Zea, KEA, or TSIA. One of the Cyclades; 12 m. e. from Cape Sunium. It is very fertile, producing cotton, figs, and wine. The town of Z. is on the middle of the island. Area 40 sq. m., pop. ab. 4,000.

Zeal. Earnest enthusiasm on behalf of any cause.

Zealand, or ZEELAND. Dutch province, composed of Walcheren and five other islands. It produced most of the Sea Beggars, and, with Holland, led in the war of liberation. Area 690 sq. m.; pop., 1893, 204,561.

Zealand. See SEELAND.

Zealots. Jewish party in 1st century, distinguished by immoderate patriotic zeal. Simon Zelotes was perhaps one of them.

Zeballos, or **Ceballos,** PEDRO DE, 1715–1778. Spanish general, Gov. of Buenos Ayres 1760–66; Viceroy there 1776–78.

Zebedee. Galilean master fisherman, father of the Apostles James and John.

Zeboim. 1. One of the five cities of the plain or circle of Jordan, Gen. x. 19. 2. Ravine, apparently e. of Michmash, mentioned in I. Samuel xiii. 18.

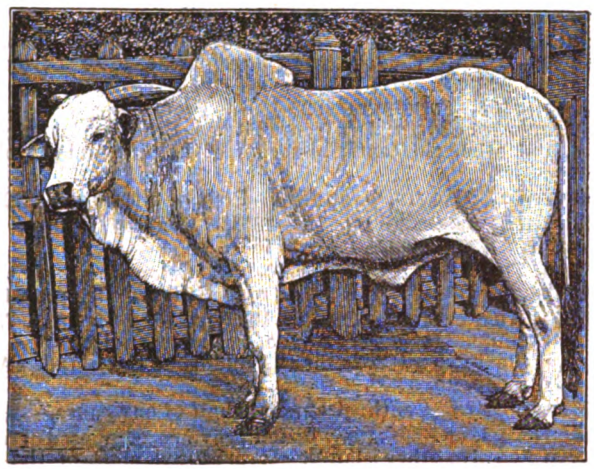
Zebras. Two species of *Equus*, having whitish-yellow skin beautifully marked with almost black stripes, confined to Africa: *E. zebra* (*montanus*) and *E. burchellii*. The true zebra lives only in the mountains of Cape Colony, where it has nearly been exterminated, and s. of Abyssinia; the latter some consider a separate species, *E. grevyi*. *E. zebra* has long ears, small upright mane, asinine tail, and is barred everywhere, except belly, even on the tail and the legs down to the hoofs.

Zebra (*Equus burchellii*).

It stands 4 ft. at the withers, is 8 ft. long, and has but 2 mammæ. Burchell's zebra lives in now decreasing herds on the plains of S. Africa, like the rarer Quagga, with which it is sometimes confounded. The Quagga has legs and entire hindquarters unstriped, while in the *E. burchellii* these regions are partially and faintly striped. Compared with the zebra, the ears and tail of *E. burchellii* are more equine, its mane is higher, and it has 4 mammæ. The flesh of these animals is highly esteemed as food by the natives.

Zebra Wood. Striped wood found in Guiana and the W. Indies, and used for veneering.

Zebu (BOS INDICUS). Domesticated species of the BOVIDÆ (q.v.), distributed throughout s. Asia, and characterized by the presence of a hump on the withers, long pendulous ears, very short upright horns, varied color, reddish-yellow to white. They are somewhat smaller than the cattle of Europe, and



Zebu (*Bos indicus*).

in India have been bred for specific purposes, resulting in several races, useful for milk, draught, riding, etc. White bulls when branded with the image of Siva are held especially sacred by the Hindus: they are free from labor and restraint, and are not molested even when they commit depredations.

Zebulun. Tenth son of the patriarch Jacob, and ancestor of one of the twelve tribes of Israel.

Zechariah. Jewish prophet, author of 38th O. T. book, ab. 520 B.C., written to encourage the despondent Jews after the return from Babylon. Chapters ix.–xiv. are perhaps much older.

Zedekiah. Last king of Judah 598–588 B.C.; son of Josiah. Rebelling against Nebuchadnezzar of Babylon, his suzerain, he saw Jerusalem taken, the temple burned, his sons slain, and was then blinded and carried to Babylon, there to die in prison. Jer. xxxiv. 2–5.

Zedlitz, JOSEPH CHRISTIAN VON, 1790–1862. Austrian poet and dramatist.

Zedoary. Name given to the roots of several species of *Zingiber* and *Curcuma*, native of China and Bengal, resembling ginger in its qualities, but now entirely replaced by the latter.

Zeeland. See ZEALAND.

Zeisberger, DAVID, 1721–1808. Moravian missionary among the Indians of Pa. and Ohio; abundant in labors and sufferings. *Delaware Dictionary*, 1887; *Onondaga Grammar*, 1888; *Diary*, 1888.

Zelaya, JOSÉ SANTOS, b. ab.1845. Pres. of Nicaragua 1893.

Zell, BERNHARD, 1715–1779. German traveler in Mexico and Cal. His *Reisen*, 1771–72, indicated the existence of gold in Cal.

Zell, MATTHAUS, 1477–1548. Reformer at Strasburg.

Zeller, EDUARD, b.1814. Prof. of Theology at Berne 1847 and Marburg 1849, of Philosophy at Heidelberg 1862 and Berlin 1872–94. *Philosophy of the Greeks*, 1844–52 and later, tr. in 6 vols. 1868–83; *Hist. Apostles*, 1854, tr. 1875–76; *Strauss*, 1874.

Zeller, JULES SYLVAIN, b.1820. Prof. Paris 1858; historical writer: especially on Italy and Germany.

Zelter, KARL FRIEDRICH, 1758–1832. German musician, teacher of Mendelssohn; conductor Singakademie in Berlin; founder Royal Institute for church music 1809.

Zenana. Harem or women's apartments in India.

Zend. Old Persian dialect, sometimes called Old Bactrian, in which was written the sacred book of Zoroaster, the AVESTA (q.v.). It comprised three books of verse, hymns, prayers, and laws.

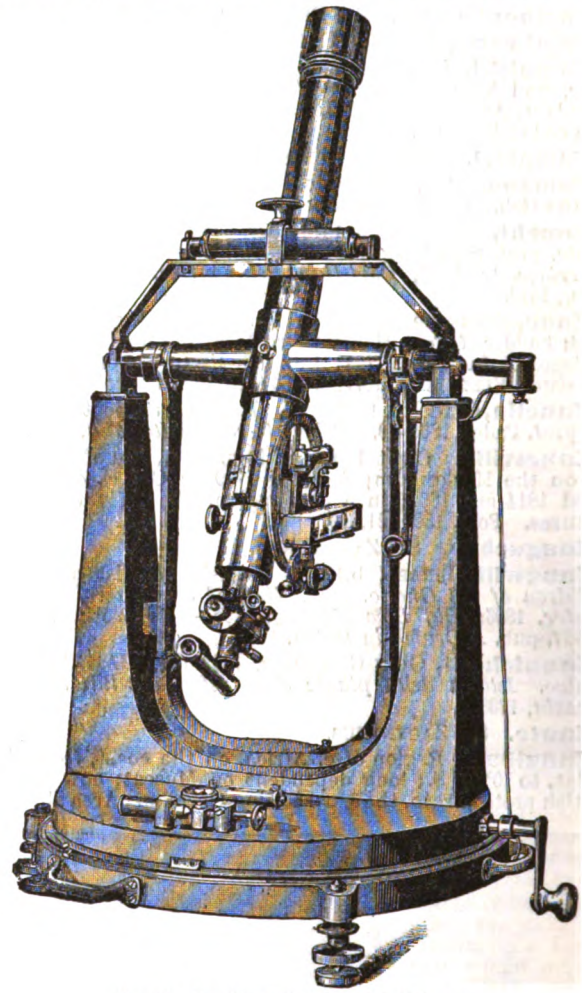
Zendejas, MIGUEL GERONIMO, 1724–1816. Mexican painter, self-taught.

Zenea. JUAN CLEMENTE, 1834–1871. Cuban lyric poet and patriot; executed.

Zenith. Point where the plumb-line produced upward pierces the celestial sphere.

Zenith Distance. That of a star from the zenith, measured on a great circle.

Zenith Telescope. Instrument much used for determination of latitude. It consists of a telescope having an altitude and azimuth mounting, provided with a delicate level and micrometer, by means of which the difference of zenith distance



Combination Transit and Zenith Telescope.

of two stars may be measured. These stars are so selected that one culminates n. of the zenith, the other s. at approximately equal zenith distances. The measurements so made with the declinations of the stars furnish data for determining the latitude.

Zenker, JONATHAN KARL, 1799–1837. Prof. Jena 1828. *Die Pflanzen und ihr wissenschaftliches Studium überhaupt*, 1830; *Merkantilische Waarenkunde*, 1831–35.

Zeno, 5th cent. B.C. Philosopher of Elea, s. Italy; pupil of Parmenides; famous for his denial of the existence of motion and for the paradoxical illustrations of Achilles and the Tortoise, and of the flying arrow, to prove his position.

Zeno, ab.350–260 B.C. Philosopher of Cyprus, founder of the Stoic school or "Porch" at Athens ab. 312 B.C.

Zeno, d.491. Byzantine Emperor 474; Isaurian; son-in-law of Leo I.

Zeno, APOSTOLO, 1668–1750. Italian dramatist, poet, and critic. Plays, 10 vols., 1744; *Epistole*, 6 vols., 1785.

Zeno, NICOLO, ab.1340–ab.1391. Venetian seaman, said to have visited Greenland, Newfoundland, and coasted as far s. as Virginia.

Zenobia. Wife of Odenathus, King of Palmyra, Queen of the East 266; defeated and made prisoner by Aurelian 272; led in his triumph 274.

Zenon de Rouvroy, CHARLES ALBERT, 1698–1759. French writer on the American colonies.

Zenteno, CARLOS DE TAPIA, 1698–ab.1770. Prof. Mexico; writer on Aztec language.

Zenteno, JOSÉ IGNACIO, 1785–1847. Chilian general and minister of war, active against Spain.

Zeolite. Group of minerals, including a number of species,

essentially hydrous silicates with aluminium and an alkali or alkaline element as basic components, agreeing closely with each other in type of chemical composition, but varying widely in color, hardness, and crystalline form. They are minerals of secondary origin, in some respects analogous to the feldspars. When heated before the blowpipe, they easily part with their water, often with intumescence and an appearance of boiling. The word signifies boiling-stone.

Zephaniah. Hebrew prophet, author of 36th O. T. book, ab.625 B.C., directed against the corruptions of Judah.

Zepharovich, VICTOR VON, 1830–1890. Prof. Cracow and Prague; writer on crystallography; connected with Austrian surveys.

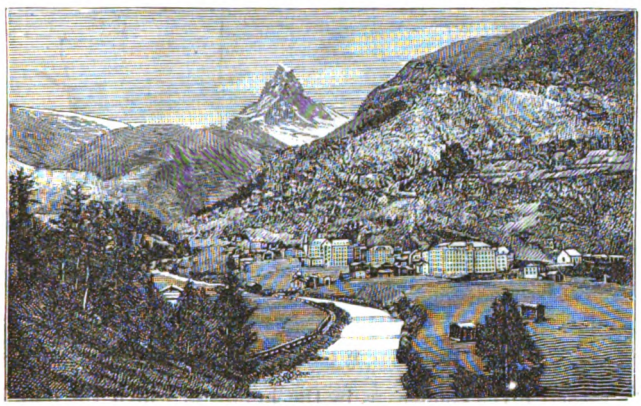
Zephyrinus. Bp. of Rome 199–218.

Zephyrus. West wind, personified in Greek mythology.

Zequeira, MANUEL DE, ab.1760–1846. Cuban poet.

Zerafshan. River of Bokhara, useful for irrigation, but lost in the sand near Samarkand.

Zermatt. Village in the canton of Valais, Switzerland, near the upper end of the Visp valley, 25 m. s.s.w. of Visp. It is a great tourist resort and center of Alpinists; starting-point for the ascent of the Matterhorn. The railway from Visp to



Zermatt and the Matterhorn.

Z., opened 1891, combines adhesive (max. gradient 45:1,000) and rack and pinion (125:1,000) systems. The graves of many of the victims of mountaineering are here. Altitude 5,315 ft., pop. ab. 2,000.

Zero. (A) Absence of magnitude; absolute nothing. (B) Less than any assignable quantity; beginning of magnitude; treated algebraically as a positive even integer; used as a limit in higher analysis. Zero co-ordinates of position indicate coincidence with fixed elements of reference. The zero angle denotes sameness of direction. Zero as a term does not affect the result: as a factor, it gives a zero-product: as a dividend with a finite divisor, it gives a zero-quotient, or, by the theory of limits, as the dividend approaches the zero, the ratio approaches zero as a limit. As a divisor with a finite dividend, zero is said to give an infinite quotient, or, by the theory of limits, as the divisor approaches zero, the ratio increases without limit. The ratio, zero divided by zero, $\frac{0}{0}$, is indeterminate. See ABSOLUTE ZERO.

Zero-Axial. Determinant whose principal diagonal has only zero terms.

Zerotin, KARL VON, 1564–1636. Gov. of Moravia 1608–15; protector of the Unitas Fratrum or Bohemian Brethren; exiled 1627.

Zerrahn, CARL, b.1826 in Germany. Director Boston Handel and Hadyn Society since 1854; conductor at many concerts and festivals.

Zerubbabel. Leader of the Jews who returned from Babylon 536 B.C. to rebuild Jerusalem and the Temple.

Zeruiah. Elder half-sister of King David, and mother of his generals, Joab, Abishai, and Asahel.

Zesen, PHILIPP VON, 1619–1689. German poet and novelist *Torments of Love.*

Zetland. See SHETLAND.

Zetterstedt, JOHAN WILHELM, 1785–1874. Swedish botanist and zoölogist; prof. Lund 1839–53. *Diptera Scandinaviæ,* 14 vols., 1842–60.

Zeugita. See ALLOPOLA.

Zeuglodon. Huge fossil cetacean found in the Eocene beds of several Gulf States. Its vertebræ are so abundant in places that they are piled up in the fields to clear the land.

Zeuglodontia. See ARCHÆOCETI.

Zeugobranchiata. Suborder of *Gastropoda,* including forms having paired bipennate gills, and paired kidneys, of which the left one is rudimentary. The heart has two auricles; the rectum perforates the ventricle. The lip of aperture of shell is cleft, as is the anterior border of the mantle. The radula has in each transverse row of teeth a great number of lateral hooked plates, arranged in a fanlike manner. There is no proboscis or siphon. The animals are herbivorous; the shell resembles that of the *Patellidæ. Fissurella* and *Haliotis* are examples. Some place the group as a subdivision of RHIPIDOGLOSSA (q.v.).

Zeuner, CHARLES, 1795–1857. German-American organist, composer, and compiler in Boston and Philadelphia.

Zeus. Chief of Greek deities; son of Cronos and Rhea; father of many mythological personages; later identified with,

Bust of Zeus, by Otricoli.

or replaced by, the Roman Jupiter. In Homeric mythology, Z. is king of gods and men, the supreme ruler, the sovereign source of law and order, the fountain of justice, and the final arbiter of disputes.

Zeuxippus. Successor of Ænesidemus in the leadership of the revival of Pyrrhonian skepticism.

Zeuxis, 5th cent. B.C. Greek painter of great fame, rivaled only by Parrhasius; at Athens ab.420 B.C. Helen, Hercules and Zeus were among his most noted subjects.

Zhitomir. See JITOMIR.

Zhukofsky, VASILII, 1783–1852. Russian lyric poet and translator.

Zidon. See SIDON and TYRE.

Ziegenbalg, BARTHOLOMEW, 1683–1719. German missionary at Tranquebar, s. India, from 1706; tr. N. T. into Tamil 1711.

Ziegler, ERNST, b.1849. Prof. Zurich 1881, Tübingen 1882; writer on pathology.

Ziegler, HEINRICH, b.1841. German theologian. *Irenæus,* 1868–71; *Christus,* 1891.

Ziem, FELIX, b.1821. French painter, distinguished for views of Venice: at his best, which is infrequent, a magnificent colorist.

Ziemer, HERMANN, b.1845. German writer on syntax.

Zierikzee. Town of Schouwen, Zealand; memorably though vainly defended against Spaniards 1576. Pop., 1890, 7,060.

Zieten, or **Ziethen,** HANS JOACHIM VON, 1699–1786. Prussian general of cavalry 1760, distinguished in the wars of Frederick II. against Austria.

Zietrisikite. Natural hydrocarbon compound, occurring as a mineral in wax-like masses; in many of its properties allied to ozokerite.

Ziggerat. Artificial hill intended for sacred uses in old Babylonia; usually constructed with seven platforms, but sometimes with two. There is no evidence that the different stories were painted in different colors, as has been asserted, or that the use was necessarily astronomical. It may be regarded simply as an attempt to reproduce a mountain. The Tower of Babel was unquestionably a ziggerat.

Zig-Zag. Molding peculiar to Norman style of architecture, of considerable variety.

Zigzag Riveting. Riveted joints where the rivets in parallel rows are placed alternating with each other, thus making a tight joint. See CHAIN RIVETING.

Zigzags. Approaches constructed from the parallels in siege operations to reach the covered way of the besieged position. Their general direction is along the capitals of the bastion or polygonal work to be attacked. Each branch is directed obliquely to the front, so as to pass to the front of any position which the enemy can occupy to enfilade them. They are constructed by the flying, full, or double-sap, under the direction of the engineer officers charged with the conduct of the siege. See SIEGE.

Ziller, TUISKON, 1817–1882. Prof. Leipzig 1864; writer on pedagogy and ethics.

Zillerthal. Tyrolese valley, n. of that of the Inn; 400 Protestants were expelled from it 1837.

Zilpah. Handmaid of Leah and inferior wife of Jacob; ancestress of the tribes of Issachar and Zebulun.

Zimb. Venomous dipterous insect found in Abyssinia, resembling and related to the TSETSE (q.v.).

Zimbabye, or ZIMBABWE. Remarkable ruins in British S. Africa, to the s.e. of Fort Victoria, in 20° 16′ 30″ S., and 31° 7′ 30″ E., at an altitude of 3,340 ft. The ruins evidently formed a garrison for the gold-producing race in remote antiquity, of whose work many traces have been found.

Zimisces, JOHN, 925–976. Byzantine Emperor 969–976. His abundant coins show the head or figure and titles of Christ, instead of his own.

Zimmerman, JOHANN GEORG VON, 1728–1795. Swiss physician and author of vast repute in his day. His *Solitude*, 1755, was widely read.

Zin. N.e. part of the wilderness in which the Israelites wandered in coming out of Egypt.

Zinc. Zn. Element. At.wt. 65.3, valence II.; mentioned first by Basil Valentine, and Paracelsus, 15th century. White metal with a bluish-gray tint, malleable between 100° and 150° C., but crystalline and somewhat brittle below 100°, and brittle as glass above 200° C. Sp.gr., cast 6.9, rolled or hammered 7.2 to 7.3; mpt. 424° C.; bpt. ab.1,000° C.; sp.ht. 0.0956 (0 to 100° C.). Heated to bright redness, it takes fire in the air and burns with a greenish-blue light to white flakes of oxide (Philosopher's wool). When exposed to moist air it becomes coated with a basic carbonate. It is soluble in the common acids and in sodium and potassium hydroxides.

Zinc, METALLURGY OF. The principal zinc ores are as follows: Zincblende or sphalerite, a zinc sulphide, ZnS, containing 67 per cent of zinc when pure, but carrying up to 18 per cent of iron and to 3 of cadmium. It is found in many countries, and very abundantly in Mo. Zincspar or smithsonite is a carbonate, $ZnCO_3$, carrying 52 per cent of zinc. Calamine is a hydrous silicate, $2ZnO.SiO_2H_2O$, occurring in white, knuckle-like bunches of crystals. Similar-looking smithsonite is often erroneously called calamine. Willemite is anhydrous silicate, $2ZnO.SiO_2$. Zincite is red oxide, ZnO, its color being due to iron and manganese. Franklinite is a black mineral like magnetic iron ore, and consists of oxides of zinc, iron and manganese. The latter three minerals are found abundantly only in n. N. J. These minerals all have value as ores of zinc; they occur in many forms and under many diverse geological conditions. There are also other minerals, less common, in which zinc is an essential constituent.

The principle on which the smelting of zinc ores is based is the reduction of the oxide ore by carbon in a closed retort, and condensing the zinc vapors driven off. If the ore is a sulphide ore, it must first be roasted to oxide as a preliminary to reduction. This volatilization of the zinc is practically inevitable, because, under atmospheric pressure, zinc boils at a temperature less than is required for the reduction of its oxide. The temperature of reduction is a bright reddish yellow, ab.1,150° C., while zinc boils at ab.1,000° C.

When a mixture of oxidized zinc ore with granulated carbon is heated, it is probably not the carbon which directly abstracts oxygen from the ore, since such action could take place only at the few points of contact of carbon and ore; but the small amount of air always present forms with the carbon carbonic oxide, which reduces the ore over all its surface, forming carbonic acid gas. The latter is reduced back by carbon to carbonic oxide, and thus the cycle continues.

The roasting of sulphide ore (black-jack ore) to oxide requires considerable care. The finely-divided ore is heated slowly to bright redness in a roasting furnace, with excess of air admitted, being continually turned over. At a low heat, the sulphide forms largely sulphate, $ZnSO_4$, which at a higher heat splits up into ZnO and SO_3, the former being then suitable for reduction.

The original form of apparatus for reducing zinc ores is no longer in use. It was called the English process, and consisted of crucibles in which the charge was heated, with tightly fitting covers, and a pipe passing through a hole in the bottom and reaching above the charge and below the crucible into a clear space below the fire; the lower part of the tube serving as a condenser for the zinc vapors driven off the charge, whose only outlet was through the pipe. The melted metal condensed in the tube trickled down into pots set beneath. The capacity of the crucibles was so small, and the consumption of fuel so great, that the process could not compete with the muffle and retort furnaces.

In Belgium, cylindrical or oval retorts are used, placed ab. 100 in a furnace, as shown in Fig. 1, where *a* is the charge in

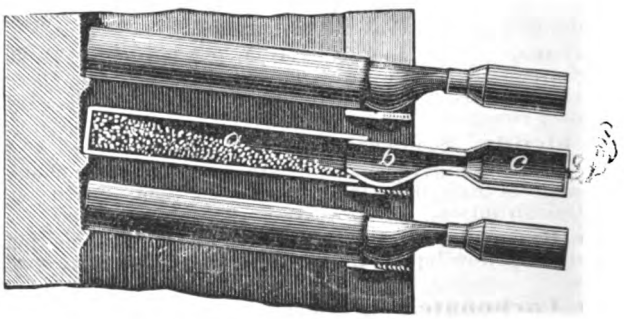


Fig 1—Retorts, R ceivers, and Prolongs.

the retort; *b* the condenser, in the hollow of which the liquid zinc accumulates; *c* the prolong in which zinc vapor is still further caught as a blue powder. Only ab. 20 to 30 lbs. of ore is treated at once in a muffle, the operation requiring 10 to 12 hours. Usually only three-quarters to four-fifths of the metal in the ore is extracted, the cost of working being ab. two and a half cents per lb. of zinc. The price paid for the ore averages one cent per lb. of zinc contained. With the older furnaces, fired by coal, the fuel consumed was a considerable item of expense; the modern furnaces are longer and fired by gas, thus effecting considerable economy in fuel, as well as causing a less rapid destruction of the muffles.

In Silesia the muffles are several times as large, and are called retorts. In Fig. 2 is shown the retort A, the condenser *a*, and

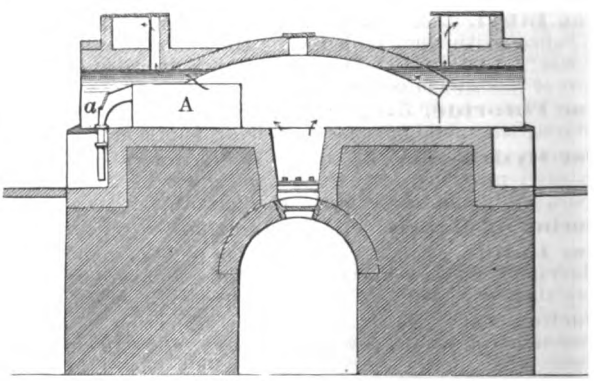


Fig 2—Silesian Zinc-Furnace; transverse section.

their situation in the furnace. Each furnace contains ab. 24 of these retorts, each taking 60 lbs. of calcined ore, with carbon, skimmings of metal, etc. The operation takes ab. 24 hours; gas firing is used in all the recently-constructed furnaces.

The zinc made in these furnaces is usually pure enough to go at once to the market. If a greater degree of purity is needed, the metal may be re-distilled, but a cheaper method is to melt it in a large pot and allow it to cool quietly and slowly. Lead sinks to the bottom and accumulates, while iron combined with some zinc falls to the bottom as a sandy residue; the purer zinc is ladled from the surface.

In Europe, Silesia and Belgium have long been large producers of zinc, and zinc ores are abundant in Italy and in Spain.

The U. S. now ranks third in the list of zinc-producing countries, extensive deposits of ores being found in n. N. J., e. Pa., Va., s.w. Wis., Mo., and other States. In 1897 the product of zinc in the U. S. was, in short tons, East and South, 9.673; Ill. and Ind., 38,616; Kan. and Mo., 51,814; total, 100,103; ab. one-fourth the product of the world.

Commercial zinc (sometimes called spelter), usually contains lead, cadmium and iron, while tin, copper, arsenic, sulphur and carbon may be present in traces; it averages 98 to 99.5 per cent of zinc. Its market price is 4 cts. per lb.; re-distilled zinc commands 6 cts.

Zinc has been known as a commercial metal only since 1805; but it has many and important uses. Sheet zinc has many applications, while the metal is cast into art-castings and battery plates. The process of coating iron or steel with zinc by first cleaning and then dipping into the melted metal, the process erroneously called galvanizing, consumes a large proportion of the zinc made.

In alloys, the most important is brass, which is red brass when containing 3 of copper to 1 of zinc, and yellow brass with 2 of copper to 1 of zinc. Before zinc itself was known, brass was made by reducing together a mixture of zinc and copper ores; but now it is made entirely by melting the zinc into the copper. See BRASS and COPPER, METALLURGY OF.

Zinc, STRENGTH OF. Spelter zinc has a compressive ultimate strength of ab. 40,000 lbs. per sq. inch.

Zincates. $Zn_3(OH)_2(ONa)_4.17H_2O$; $(2Zn(OH)(ONa).7H_2O$. Zinc hydroxide is soluble in alkaline hydroxides; from these solutions crystallized salts have been obtained, which have been called zincates.

Zincblende. See SPHALERITE.

Zinc Bloom. Hydrous zinc carbonate formed by chemical change of zinc ores; found in considerable quantity in some Spanish mines.

Zinc Bromide. $ZnBr_2$. White soluble needles, melting to a bright yellow liquid; made by treating heated zinc with bromine.

Zinc Carbonate. Its composition varies according to condition. When zinc sulphate is precipitated with sodium carbonate, the basic salt $Zn(OH)_2.ZnCO_3.ZnO$. is formed. It occurs in nature as SMITHSONITE (q.v.).

Zinc Chlorate. $Zn(ClO_3)_2+6H_2O$. Hygroscopic soluble crystalline substance with an herb-like odor; mpt. 60° C.; made by treating the carbonate with chloric acid and evaporating.

Zinc Chloride. $ZnCl_2$. White, deliquescent substance, volatile at 680° C.; made by dissolving zinc in hydrochloric acid. It forms double salts with the alkaline chlorides.

Zinc Cyanide. $Zn(CN)_2$. Lustrous orthorhombic prisms, or amorphous powder, soluble in alkalies; made by treating the acetate with hydrocyanic acid.

Zinc Dust. Mixture of the metal and the oxide, obtained in the reduction of zinc ores, or by pulverizing the metal at a temperature just below its melting point. It is used as a reducing agent in chemistry.

Zinc Ethyl. $Zn:(C_2H_5)_2$. Zinc ethide; combination of the ethyl radical with zinc; prepared by the action of ethyl iodide upon zinc; liquid, bpt. 118° C., which takes fire with explosive violence if brought in contact with the air.

Zinc Fluoride. ZuF_2. Soluble needles, sp.gr. 4.84; made by treating the metal or oxide with hydrofluoric acid.

Zinc Hydroxide. $Zn(OH)_2$. White, amorphous, insoluble powder, made by adding a soluble hydroxide to a soluble zinc salt; soluble in excess of the precipitant.

Zincing of Metals. See GALVANIZING.

Zinc Iodide. ZnI_2. Octahedra, or cubes modified by octahedra. They decompose on heating, and are made by heating zinc with iodine.

Zincite. ZnO. Natural zinc oxide, occurring in n. N. J. as a red mineral, whose powder is orange-yellow in color; red zinc ore.

Zinc Methyl. $Zn:(CH_3)_2$. Zinc methide. See ZINC ETHYL, to which it corresponds in every respect.

Zinc Nitrate. $Zn(NO_3)_2+6H_2O$. Clear, four-sided columns; mpt. 36.4° C., bpt. 131° C.; made by dissolving zinc in nitric acid.

Zinc Nitrite. $Zn(NO_2)_2+3H_2O$. Hygroscopic crystals, decomposing at 100° C.; made by treating zinc sulphate with barium nitrite in solution.

Zinc Oxide. ZnO. Flores zinci, Zinc White, Philosopher's Wool. White powder, turning yellow when heated; made by burning zinc or igniting the carbonate; used extensively as a constituent of white paint, and for complexion powders. It is made on a large scale by mixing pulverized blende, freed from sulphur by roasting, or other zinc ores, with fine anthracite or coke, and burning the mixture in a furnace. The zinc is reduced to the metallic state and free access of air converts it into the oxide. The light zinc oxide with the gases are drawn through a series of chambers, where the heavier impurities are deposited and the gases with the oxide are forced into cotton bags, the gases passing through the tissue, the oxide being retained. This is ground with linseed oil for a white pigment. It does not cover as well as white lead and, not forming so strong a combination with the oil, does not withstand the weather as long. It is not blackened by sulphur vapors from burning coal or illuminating gas. In 1897, 26,275 short tons were produced in the U.S.

Zinc Phosphate. $Zn_3(PO_4)_2$. Prisms, sp.gr. 3.99, melting at a red heat; made by boiling the oxide or carbonate in phosphoric acid.

Zinc Sulphate, ZINC VITRIOL, or WHITE VITRIOL. $ZnSO_4+7H_2O$. Transparent, rhombic prisms, made by roasting zinc blende and extracting with water; used in the preparation of cotton-prints and in medicine; found in nature as the mineral GOSLARITE (q.v.).

Zinc Sulphide. ZnS. Found in nature as SPHALERITE and BLENDE (q.v.). Artificially it is made by adding a soluble sulphide to a soluble zinc salt. It is a white, amorphous substance.

Zinc White. See ZINC OXIDE.

Zingarelli, NICOLA ANTONIO, 1752–1837. Italian composer of 31 operas, 4 oratorios, over 150 masses, and many motets, hymns, etc.

Zingerle, IGNAZ VINCENZ, b.1825. Tyrolese poet and historical writer, prof. Innsbruck 1859.

Zinkenite, or ZINCKENITE. $PbSb_2S_4$. Rare mineral compound of lead, sulphur, and antimony, first found at an antimony mine in the Harz Mountains.

Zintgraff, EUGEN, 1858–1897. German traveler in Africa.

Zinzendorf, NICHOLAS LUDWIG, GRAF VON, 1700–1760. Protector of Moravian exiles at Herrnhut 1722; reviver of the

Nicholas Ludwig Zinzendorf.

Unitas Fratrum; Bp. 1737; exiled from Saxony 1736–47; active in travel and missionary labors; in Pa. 1741–42; voluminous writer, especially of hymns. Several of these, tr. by J. Wesley, are in familiar use.

Zion. S.w. hill of JERUSALEM (q.v.); ht. 2,540 feet.

Zipporah. Daughter of Jethro or Raguel, and wife of Moses.

Zircon. $ZrSiO_4$. Zirconium silicate, found as a rare mineral in several widely separated parts of the world, as Ceylon, Australia, N. C., and Norway, usually as an accessory ingredient in crystalline rocks. When transparent, colored and brilliant in luster, it has value as a gem-stone under the name of hyacinth. The duller opaque varieties are utilized in the preparation of the highly refractory earth, zirconia.

Zirconia. See ZIRCONIUM OXIDE.

Zirconium. Zr. At.wt. 90.6, sp.gr. 4.15, sp.ht. .066, valence IV. Discovered by Berzelius 1824; rare metal, obtained

by heating potassium fluozirconate with aluminium, as an amorphous black powder or in crystalline metallic leaflets. It occurs in nature chiefly as zircon, $ZrSiO_4$.

Zirconium Bromide. $ZrBr_4$. White, crystalline powder, decomposed by water; made like the chloride.

Zirconium Chloride. $ZrCl_4$. White substance, fuming in the air; decomposed by water; made by treating a heated mixture of the oxide and carbon with chlorine.

Zirconium Fluoride. $ZrFl_4$. Colorless, translucent crystals, made by heating a mixture of fluorspar and zircon in hydrochloric acid gas.

Zirconium Hydroxide. $Zr(OH)_4$. White, amorphous powder, precipitated from acid solutions of zirconium by ammonium hydroxide; decomposed by heat, yielding zirconium oxide.

Zirconium Oxide. ZrO_2. Zirconia. Amorphous powder, or quadratic prisms, obtained by igniting the metal or heating the hydroxide.

Zirconium Silicate. See ZIRCON.

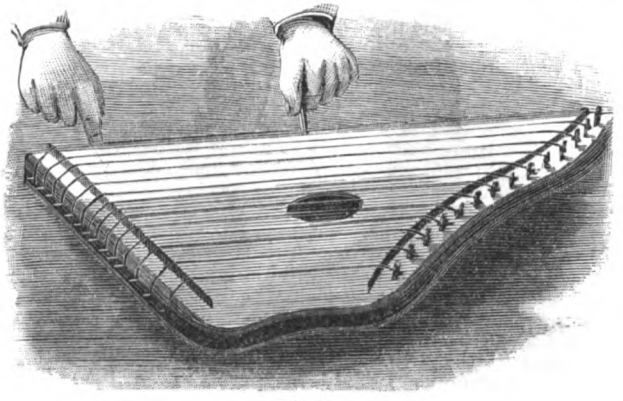
Zirconium Sulphate. $Zr(SO_4)_2$. White mass, soluble in water, decomposing on heating; made by treating the hydroxide with sulphuric acid.

Zirknitz, LAKE OF. In Carniola, Austria. In August, the water sometimes disappears long enough to raise a crop of hay on the bottom, being connected underground with the river Laibach, and the caves of Adelsberg. Length 6 m., breadth 3 m., depth 15–50 ft., alt. 1805 ft.

Z Iron. Bar whose cross-section resembles the letter Z, really like this ⊤⊥; rolled of wrought-iron and steel, and used for making posts and compression members in bridges.

Ziska, JOHN, 1360–1424. Bohemian officer, distinguished at Tannenberg 1410, and Agincourt 1415; leader of the Hussites from 1419; one-eyed, and blind from 1421; victor in 13 battles and 100 skirmishes; only once defeated. At Deutsch-brod, Jan. 18, 1422, he routed the Emperor Sigismund, who had violated his safe-conduct and given Huss to the flames.

Zither. Musical instrument, extremely popular in the Tyrol and other mountainous sections of Germany and Austria. It consists of a flat sound-box strung with from 36 to 42 strings, all but five of which are of gut or silk. The five are of metal, and



Zither.

are extended over a finger-board fretted chromatically. Upon this board the tones are formed by the fingers of the left hand; the melody is plucked by means of a ring or plectrum fastened to the thumb of the right hand, while the harmony is supplied by the fingers, as in the case of a harp.

Zittau. Town in s.e. Saxony, on a lignite deposit of 20 sq. m. It has manufactures of linen and cotton goods, dye and bleaching works, iron-smelting and glass works; also mineral springs. It was burned in the Austrian bombardment 1757. Pop., 1890, 25,400.

Zittel, CARL ALFRED VON, b.1839. Prof. Munich 1866; author of an extensive handbook of Paleontology.

Znaim. Town of Moravia: scene of a French victory July 11, 1809. An armistice was concluded the next day. Pop., 1890, 14,515.

Zoan, or TANIS. Former capital of Egypt under the Hyksos kings and in 19th dynasty; in the Delta; often mentioned in O. T.; destroyed 174. Its remains were explored by Petrie 1883–84.

Zoantharia (HEXACTINIA). Division of *Anthozoa*, including coral polyps or polyp-stocks with tentacles in concentric circles and with the mesenteric septa in multiples of six. This group includes the most common corals. The anatomy of the soft parts is similar to that in the Sea-Anemone (*Actinia*). There are three groups: *Sclerobasica* (*Antipatharia*), *Malacodermata* (*Actinaria*), and *Scleroderma*ta (*Madreporaria*).

Zoanthidæ. Family of *Zoantharia*, *Malacodermata*, or Polyps, closely related to those that secrete coral, but free, having no hard, rock-like support; further characterized by including compound individuals, each consisting of many polyps united by a common cœnosarc. The walls of these polyps are often strengthened by a crust containing grains of sand or spicules.

Zoar, or BELA. One of the Cities of the Plain, s.e. of Dead Sea; spared at Lot's prayer. Gen. xix. 20–23.

Zobah. Ancient kingdom of Syria, at war with Israel.

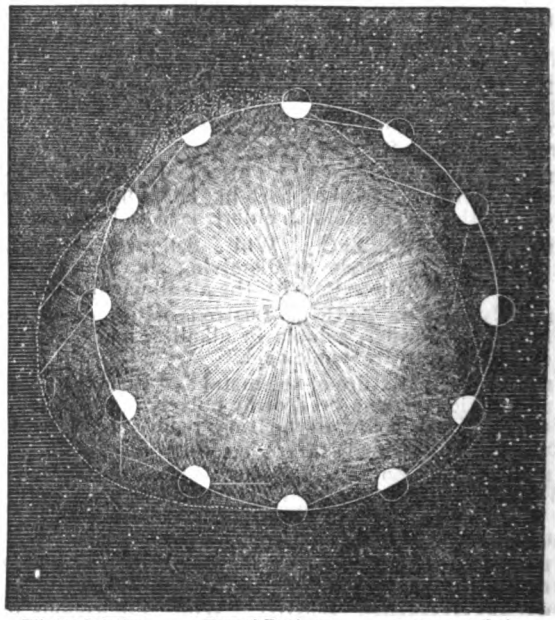
Zöckler, OTTO, D.D., b.1833. Prof. Greifswald 1866; commentator. *Cross of Christ*, 1875, tr. 1877.

Zodiac. Zone of the celestial sphere, 16° in breadth, 8° each side of the ecliptic. It is divided into twelve signs of 30° each, beginning with the vernal equinox, as follows:

Aries ♈	Libra ♎
Taurus ♉	Scorpio ♏
Gemini ♊	Sagittarius ♐
Cancer ♋	Capricornus ♑
Leo ♌	Aquarius ♒
Virgo ♍	Pisces ♓

Originally these signs corresponded to the constellations having the same names, but by the action of precession the sign Aries now corresponds to the constellation Pisces nearly, and similarly with the others. Similarly designated signs are found among the ancient Egyptians, Arabs, Hindus, and Chinese, as also among the Aztecs and other primitive American tribes. See TROPICS.

Zodiacal Light. Faint beam of light extending along the ecliptic on both sides of the sun; best seen in the evening



Winter Solstice. Vernal Equinox. Summer Solstice.

The Zodiacal Light.

during Feb., March and April; supposed to be caused by the reflection of the sun's rays by meteoric matter in the vicinity of the sun.

Zoëa. Earliest larval stage of the Lobster and Crab. (The nauplius and other early stages represented by free larvæ in lower *Crustacea* are in Lobsters and Crabs passed through within the egg-shell.) It has a cephalothorax provided with three long spines, and a six-jointed abdomen without appendages. The only locomotor appendages present are those that represent the first two pairs of maxilipedes of the adult.

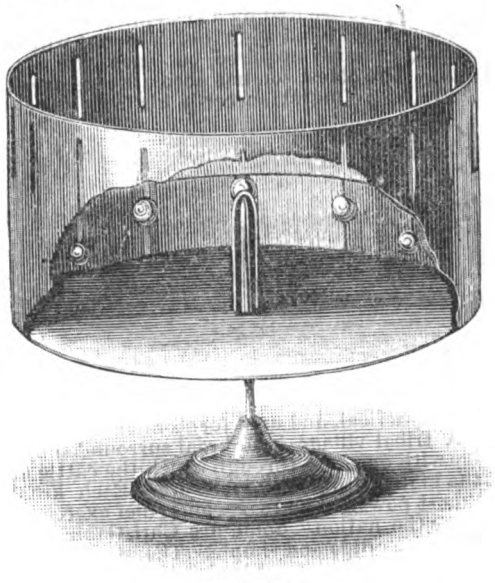
Zoecium. 1. Chamber or cell in which the polypide of a Polyzoön is contained. 2. Equivalent of zoöid.

Zoega, JOHANN GEORG, 1755–1809. Danish numismatist, antiquarian, and Orientalist, resident at Rome; cataloguer of Coptic MSS.

Zoepffel, RICHARD OTTO, D.D., 1843–1891. Prof. Strasburg 1872; ed., with H. J. Holtzmann, *Lexikon fur Theologie*, 1882–91.

Zoetrope. Optical toy in which a succession of figures in different attitudes are made to appear like a single one in motion. Two forms exist. In one the figures are arranged

in a circle on a pasteboard disk which is made to revolve on an axle with another disk, through slits in which the pictures are observed. In the other the pictures are placed on strips of



Zoetrope.

paper within a round box open at the top, which is made to revolve on an upright stand, the observer looking through slits in the box. See AFTER-IMAGES and STROBOSCOPIC DISK.

Zoffany, JOHANN, R.A., 1735–1810. German-English painter.

Zogbaum, RUFUS FAIRCHILD, b.1849. American illustrator, handling military and naval subjects. *Horse, Foot and Dragoons*, 1887; *All Hands*, 1897.

Zoilus, 3d cent. B.C. Greek vilifier of Homer.

Zoisite. Light-colored mineral of the epidote group, relatively poor in iron. It includes a part of the so-called saussurite.

Zola, ÉMILE, b.1840. French novelist, chief of the realistic school. *Thérèse Raquin*, 1867; *L'Assommoir*, 1878; *Nana*, 1880; *Germinal*, 1885; *La Terre*, 1888; *La Débâcle*, 1892; *Lourdes*, 1894; *Rome*, 1896. Some of these books have been severely criticised on the score of taste and morals, as by M. Brunétiere.

Zollicoffer, FELIX KIRK, 1812–1862. M. C. from Tenn. 1853–59; Brig.-gen. C.S.A. 1861; killed at Mill Springs, Ky.

Zollikofer, GEORG JOACHIM, 1730–1788. Pastor at Leipzig from 1758; moderate rationalist, noted for eloquence. Sermons, tr. in 10 vols. 1803–12; *Exercises of Piety*, tr. 1796.

Zöllner, JOHANN CARL FRIEDRICH, 1834–1882. Prof. of Astronomy at Leipzig 1872: author of papers on stellar photometry.

Zöllner, KARL FRIEDRICH, 1800–1860. German musician, best known by his part-songs for men's voices.—His son, HEINRICH, b.1854, since 1890 conductor Deutscher Liederkranz in New York, has composed many vocal and orchestral works and four operas, *Frithjof*, 1884, *Faust*, 1887, *Der Ueberfall*, 1895, and *Bei Sedan*, 1895.

Zollverein. Union among states, by which a common system of tariffs and a common custom house frontier are established; especially that of German states 1821–71.

Zona Radiata, or ZONA PELLUCIDA. Thick, clear membrane pierced with minute pores, surrounding the eggs of many fishes and mammals.

Zonaras, JOANNES, 1030–1118. Byzantine writer. His *Chronicon*, pub. 1557, extends to his own time.

Zonaria. See DECIDUATA.

Zonda Wind. Warm wind descending the mountain valleys on the e. side of the Andes; evidently a Föhn wind.

Zone. Portion, limited by parallel planes, of the surface formed by the revolution of a curve. A spherical zone has its area equal to the product of its altitude by the circumference of a great circle. Zones on the same sphere are proportional to their altitudes; formed by the same planes on different spheres, they are as the spherical radii.

Zonoplacentalia, or ZONARIA. See PLACENTA and PLACENTALIA.

Zoöcytology. See ZOÖLOGY.

Zoödynamics. See ZOÖLOGY.

Zoögenesis. See ZOÖLOGY.

Zoöglœa. Slimy, jelly-like coating formed on liquids that contain active bacteria. The slime is produced from the outer coats of the bacteria, which lie imbedded in it, and at the air surface of the liquid. The bacteria are producing spores. See SPORES OF BACTERIA.

Zoöid. Individuals or units making up a colony of animals, whether free or attached. They are in all cases individuals that have risen by budding or fission of the original product of an egg or its equivalent.

Zoölogical Geography. See DISTRIBUTION and ZOÖLOGICAL PROVINCES.

Zoölogical Provinces. Regions of the earth's surface distinguished by special peculiarities as regards their Fauna; viz., Palæarctic, Ethiopian, Oriental, Australian, Nearctic, and Neotropical. The Oceanic Islands have special peculiarities, as fewness of species existing on any one island, and the endemic character of those that do occur; *i.e.*, a species present on one island will be found on no other.

Zoölogy. Biology of Animals, as Botany is that of Plants; usually divided into Morphology, the study of structure, and Physiology, of function; but it is not advisable here to separate the two. Special departments are: 1. Systematic or taxonomic zoölogy, the description and classification of species: this may be called Zoötaxy, and is subdivided, according to the special group of animals studied, into Helminthology, Conchology, Entomology, Ichthyology, Herpetology, Ornithology, etc. 2. Gross anatomy of animals, special and comparative: this may be termed Zoötomy; its subdivisions are Osteology, Myology, Neurology, Angeiology, Splanchnology, etc. 3. Development of animals, including Embryology or Ontogeny, and the study of Affinities or Phylogeny, Zoögenesis. 4. Study of the minute structure of cells and tissues, or Histology and Cytology, Zoöcytology. 5. Study of fossil animal remains, or Paleontology, Palæozoölogy. 6. Geographical distribution, or Chorology, Zoögeography. 7. Darwinismus, Hexacology, Ætiology, Œcology, Teleology, and Thremmatology; study of the interaction of organization and environment, heredity, struggle for life, survival, sexual and natural selection, Zoönomics. 8. Study of the functions of the living body, Physiology or Phoronomy, Zoödynamics, with its subdivisions, zoömechanics, co-ordination, nutrition and generation. 9. Application of zoological principles in agriculture and the arts, animal industry and husbandry, Economic Zoölogy, Zoötechny. 10. Instincts, habits, Psychology and Sociology of Animals, Zoöpsychology. Philosophical Zoölogy is mainly Zoönomics; "Natural History" is the union of 1 and 10.

Aristotle (d. 322 B.C.), "Father of Zoölogy," is rather the last representative of a gradual development. After him for 2,000 years there was no advance, but rather degeneration. The revival of zoölogy occurred after 1500, stimulated by the descriptions of new animals brought by travelers and explorers. Gesner compiled a Natural History, Vesalius studied Anatomy by actual dissection, and Belon described Fishes. The 17th century saw the founding of the Royal Society of London 1662. Harvey (1616) discovered the circulation of the blood. Leeuwenhoek (1675) by his lenses discovered the Infusoria and many other animalculæ, and was the first to oppose the then prevalent belief that small animals could be spontaneously generated from mud. Other noted names of this time are Malpighi, Ray, Redi, and Swammerdam. During the 18th century Linnæus introduced the present method of naming animals, and was able more accurately to classify them. Buffon popularized natural history. Haller, the experimental physiologist, was opposed by Wolff, who believed in epigenesis. In 1796 Erasmus Darwin wrote the *Zoönomia*. The 19th century opened with Lamarck, who propounded a theory of Evolution, and the Nature Philosophers, Oken, Goethe, etc., who discovered Serial Homology. Embryology and Histology, thanks to the development of the microscope, had now been pursued so far that Von Baer could announce (1827) that Omne vivum ex ovo. Dujardin (1835) discovered Protoplasm or Sarcode, and Schwann (1841) propounded the generalization that organisms are built up of protoplasmic units, the cells. He also discovered that fermentations are due to microbic organisms. Johann Muller (1801–1858) trained up a school of eminent German zoölogists. During the first third of this century Cuvier laid the foundations of Comparative Anatomy, and opposed the idea that animals could be arranged in a series with the most complex at the top. He saw that there were types related in a branching manner. His pupil, Louis Agassiz, taught that not only species, but genera, orders, classes, etc., were fixed ideas in the Creator's plan, and needed but the discerning eye to reveal them. Owen, another of Cuvier's pupils, was imbued with the idea of homologous parts. The year 1858 marked the beginning of the modern era in Zoölogy. Darwin's *Origin of Species* showed that the animal kingdom is a continuum of individuals. The limitations of our knowledge and the loss of connecting links

enables us to see apparently isolated groups of animals. To make a natural classification, we need to know the entire history of as many animal forms as possible. This idea has been a new organon, and has stimulated and enlarged research in many directions. Marine laboratories have been established, so that the vast life of the ocean can be studied properly. Since Darwin's epoch-making work appeared, great advances in microscopical technique have enabled zoölogists to study the minute structure of protoplasm, so that a new set of facts on which to base a theory of life and heredity has been gleaned.

Zoönomics. See ZOÖLOGY.

Zoöphytes. Plant-like forms of animals, as the coral Polyps and other Cœlenterates.

Zoösperms. 1. Egg-like encysted forms of *Coccidia*. 2. *Spermatozoa*.

Zoöspores. Active flagellated young, produced by spore-formation in *Protozoa* and other low forms of life. They usually conjugate, and so produce the usual adult forms.—In Botany, minute bodies by means of which many of the lower plants are propagated. They originate by the division of the protoplasmic contents of a cell into an immense number of individual spores. They are commonly motile by means of vibratory cilia; also called Sporids, or *Sporidia*.

Zoötaxy. See ZOÖLOGY.

Zoötechny. See ZOÖLOGY.

Zoötomy. Art and science of animal dissection; divided into gross dissection and microtomy. See ZOÖLOGY.

Zorgite. Double selenide of lead and copper, found in the Harz Mts., Thuringia and Clausthal. It is the principal source of commercial selenium.

Zorndorf. Village of Brandenburg where Frederick II. defeated a Russian army Aug. 25, 1758.

Zoroaster, probably 6th cent. B.C. Founder of the religion of ancient Persia. His system was marked by moral earnestness, but fettered by dualism: Ahriman, the evil principle, being equally eternal with Ahuramazda, or Ormuzd, principle of good, though ultimately subdued by him.

Zoroastrianism. See ZOROASTER.

Zorrilla y Moral, JOSÉ, 1817–1893. Spanish poet and dramatist. *Cantos del trovador*, 1841; *El Zapatero*, 1844; *Don Juan Tenorio*, 1845; *Granada*, 1853–54.

Zosimus. Pope 417–418. After some hesitation, he condemned Pelagius.

Zosimus, 5th cent. Greek (heathen) historian of the Roman Empire to 410.

Zouaves. Regiments formed in Algeria 1830, at first consisting largely of Kabyles (Turcos), later of Frenchmen, retaining a peculiar uniform; distinguished in Africa and the Crimea; imitated by the Papal Zouaves 1860–71, and in the U. S. 1861–65.

Zrinyi, MIKLOS, 1508–1566. Slovak noble, in the Austrian service; Gov. of Croatia and Slavonia 1542; active against the Turks; killed in defending Sziget, after a month's siege; celebrated in plays and poems, as by his great-grandson, MIKLOS, 1616–1664, also Ban of Croatia, in the earliest Hungarian epic.

Zschskke, JOHANN HEINRICH DANIEL, 1771–1848. German-Swiss author, chiefly of tales and histories; notable for moral earnestness and public spirit. *Hours of Meditation*, 1809–16, tr. 1843; *Hist. Switzerland*, 1822, tr. 1855; *Goldmaker's Village*, tr. 1845; *Autobiography*, 1842, tr. 1847. *Works*, 35 vols., 1851–54.

Zubly, JOHN JOACHIM, D.D., 1725–1781. Pastor at Savannah, Ga.; active patriot, in Congress 1775; then royalist; accused of treason to U. S. and banished 1777.

Zuccaro, FEDERIGO, 1543–1609. Italian artist, of more versatility than talent; much employed as a decorator, especially in Florence, Rome and Madrid.—His brother, TADDEO, 1529–1566, did similar work.

Zug. Central Swiss canton. Area 92 sq. m.; pop., 1894, 23,167.

Zuider Zee. Arm of North Sea, separating n. Holland from Frisia and other provinces; ab. 70 m. long; formed by inundations 860 and later. The s. part, called the Y, is shallow; a plan of drainage has been proposed, which would reclaim some 500,000 acres at a cost of $50,000,000.

Zuinglius. See ZWINGLI.

Zuloaga, FELIX, 1814–1876. Pres. of Mexico 1858–59; outlawed 1860; in exile 1862–64.

Zulu. S. African agglutinative dialect, with considerable variety of linguistic forms.

Zulus. Most important tribe of the Kaffre division of the Bantu or S. African negroes. They are now restricted to the coast district s. of Delagoa Bay, but not long ago overran all s.e. Africa, conquering other tribes and imposing their own highly developed language. They are intelligent, courageous, and fierce warriors, powerfully developed, and well organized for war. They practice stock-raising and agriculture, but field-work is done by the women, except milking. Little meat is eaten during peace. Possessions consist in cattle, wives and children. Wives are secured by a system of barter, the worth of the bride being measured by cattle. The first wife is mistress over those subsequently acquired, but each wife has her own hut and land. The oldest son has absolute rule over the other children, but the youngest succeeds his father as chief. The

The King's Kraal.

huts are hemispherical, and used for storage of utensils and for sleeping. A tribal village is a kraal surrounded by a double thorn hedge with one gate through which the cattle are driven to spend the night within the inclosure. Each kraal has its chief: the most powerful and sagacious chief exercises a sort of kingship over the nation. Some are Christianized, but their religious ideas are crude and simple. The magician is the doctor, priest and judge, but must lead in battle. The well-to-do are buried; other corpses are exposed.

Zumala-Carreguy, TOMAS, 1789–1835. Spanish officer 1808–14 and 1822–32; Carlist general-in-chief 1833; killed at Bilbao after several victories.

Zumarragua, JUAN DE, 1468–1548. Superior of Franciscans in Mexico 1528–31; Bp. of New Spain 1534; protector of Indians, but fanatical and wholesale destroyer of Aztec documents.

Zumaya, MANUEL, ab.1670–ab.1740. Mexican priest, musician, and dramatist.

Zumpt, KARL GOTTLOB, 1792–1849. Prof. Berlin 1827; ed. Cicero and other classics; writer on Roman history and law. His Latin Grammar, 1818, was widely used.—His nephew, AUGUST WILHELM, 1815–1877, did similar work.

Zundel, JOHN, 1815–1882. German musician; organist of Plymouth Ch., Brooklyn, 1850–65 and 1867–78; composer.

Zuni. Pueblo Indian tribe on the Zuni branch of the Colorado in w. New Mexico. This pueblo contains ab. 1,500 persons; originally it accommodated 5,000. Frank Cushing, sent by the Smithsonian Institution to study these Indians, was initiated as a member. They are sun-worshipers, have many mystic

Zuni Woman Weaving a Belt.

orders and degrees pertaining to war, medicine, religion, etc., and practice peculiar rites and ceremonies of great interest to the ethnologist. Their language is grammatically well developed. They are undersized, religiously disposed, and peace-loving, but courageous in defense of their rights. Tradition says that they came from the northwest.

Zuniga. See ERCILLA Y ZUNIGA.

Zuniga, ALVARO, MARQUIS DE VILLA-MANRIQUE, ab.1530–ab.1600. Viceroy of Mexico 1585–90.

Zuniga, BALTASAR DE, MARQUIS DE VALERO, ab.1670–ab.1730. Viceroy of Mexico 1716–22.

Zuniga y Acevedo, GASPAR DE, COUNT DE MONTEREY, ab. 1540–1606. Viceroy of Mexico 1595–1603, and of Peru 1604; promoter of explorations in California.

Zuni Mountains. Range of New Mexico, n. of lat. 35° N., extending 45 m. from n.w. to s.e., and rising to 6,500 ft. The range is of special interest to geologists.

Zurbaran, FRANCISCO DE, 1598–1662. Spanish painter. His works are simple and serious, mainly depicting monks.

Zurich. Canton of n. Switzerland. Area 666 sq. m.; pop., 1894, 351,917. Its capital, Z., at the foot of Lake Z., was taken by Massena Sept. 26, 1799. It has varied manufactures, and a university, founded 1832. Pop., 1894, 103,271, chiefly in its suburbs.

Zurich, LAKE OF. In central Switzerland; 25 m. long e. to n.w., with a curve to the s.w.; 1½–2½ m. broad; now divided into two parts by a railway embankment. Area 33.2 sq. m., depth 470 ft.

Zurich, TREATY OF. Between Napoleon III. and Francis Joseph of Austria, Oct. 1859, concerning Italy.

Zurita, ALONSO, ab.1500–ab.1570. Spanish official and writer, in San Domingo, S. America and Mexico 1544–64.

Zurita, GERONIMO, 1512–1580. Chronicler of Aragon 1549. *Anales*, 6 vols., 1562–79.

Zutphen. Dutch town, on the Yssel; memorable for the death of Sir Philip Sidney in a skirmish, Oct. 1586. Pop., 1890, 17,044.

Zuyder Zee. See ZUIDER ZEE.

Zwickau. City of Saxony, on the Mulde, in a coal-mining region. Pop., 1890, 44,198.

Zwingli, HULDREICH, 1484–1531. Swiss reformer, precursor of Calvin. He introduced the Reformation at Zurich 1519–23,

Huldreich Zwingli.

separated from Luther as to the Eucharist 1529, and was killed in battle for freedom. He was fearless and devoted, with a plain, practical mind, and (excepting Socinus) the most liberal of the reformers. *Opera*, 4 vols., 1545. His last confession, sent to Francis I. 1531, is memorable, and caused Luther to despair of his salvation, since it admitted the salvability of good heathens.

Zygadenus, or **Zygabenus,** EUTHYMIUS. Byzantine theologian who wrote *Panoply Against All Heresies*, at the request of A. Comnenus; flourished 1081–1118. Some of his commentaries are in the Vatican in manuscript; those on the Gospels and Psalms are often consulted.

Zygantrum. Deep cavity situated medianly in the neural arch, posterior end, of a serpent's vertebra. It has a pair of articular facets, looking upward and inward, on which the articular facets of the zygosphene fit. More laterally, and facing down and outward, are the post-zygapophyses, slightly above and to the sides of the ball of the centrum.

Zygnemaceæ. Order of minute green fresh-water *Algæ*.

Zygobranchia. See CYCLOBRANCHIATA.

Zygodactylous. Yoke-toed; *i.e.*, with toes in pairs, two turned forward and two backward, as in the Parrot and Woodpecker, in which the first and fourth are turned back. In the Trogons the first and second turn back; these are heterodactylous.

Zygomorphous. Flowers or other organs which can be bisected by but a single plane into bilaterally symmetrical halves.

Zygomycetes. Sub-class of *Fungi*, characterized by the formation of a zygosperm in the process of reproduction.

Zygophyllaceæ. Natural order of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Polypetalæ*, comprising 18 genera and ab. 110 species, distributed throughout the tropics and the warmer regions of the n. hemisphere especially.

Zygopleura. See ALLOPOLA.

Zygosis. Sexual union (conjugation) of two unicellular organisms. The process is termed copulation in higher animals. In zygosis, differences of sex are not distinguishable. There is a mutual interchange of fertilizing protoplasm if the conjugation is temporary; otherwise the gametes fuse into a single zygote.

Zygosperm. Result of the union of the protoplasm from two vegetable cells in the reproductive process called CONJUGATION (q.v.).

Zygosphene. Bony wedge projecting forward medianly from the neural arch of a serpent's vertebra. Its articulating surfaces look down and outward, the opposite of the more laterally placed præzygapophyses, with which they are nearly parallel. This wedge fits into a hollow (see ZYGANTRUM) of the vertebra next in front, with which the centrum also articulates by a ball and socket joint.

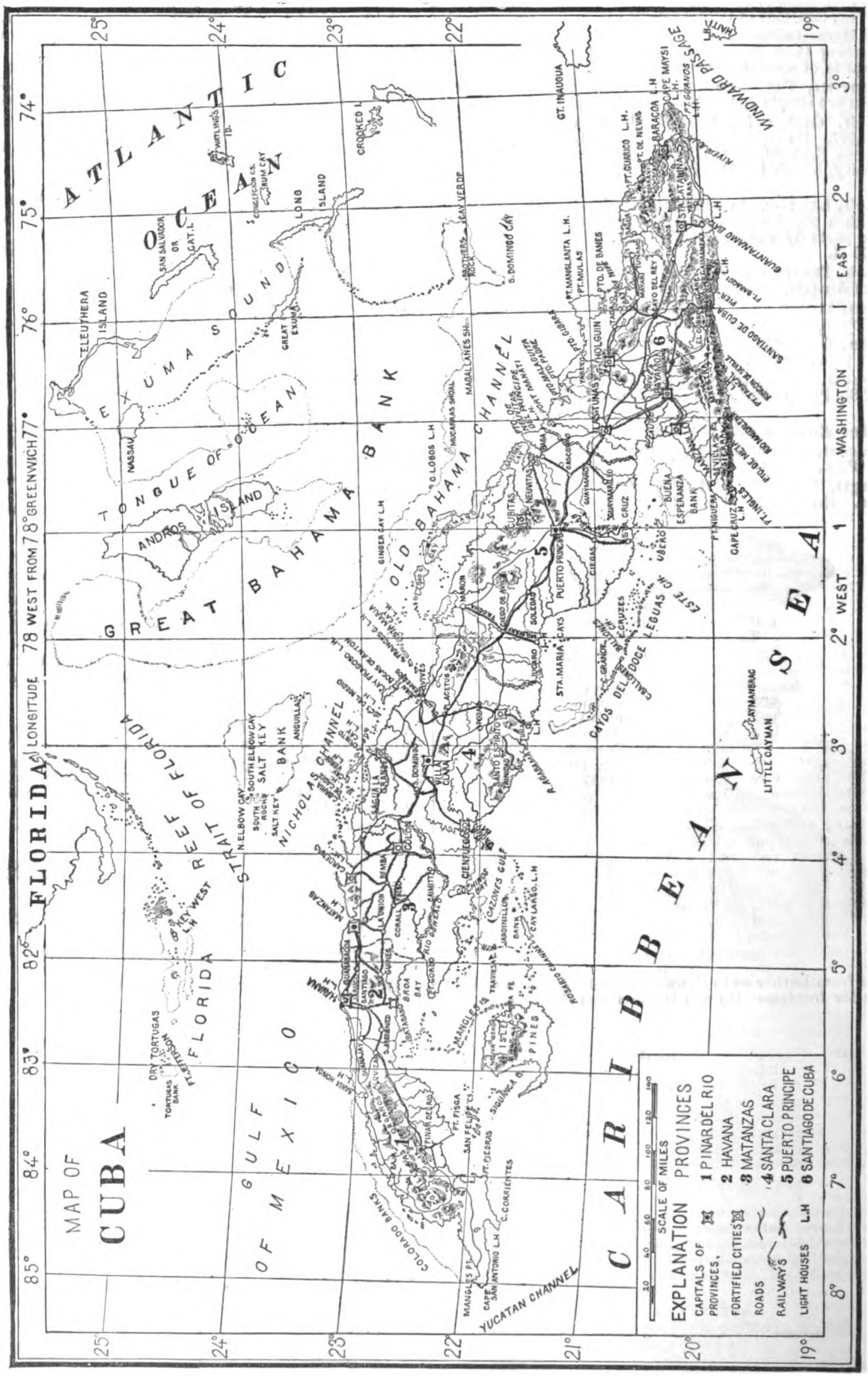
Zygospore. Spore or reproductive body produced by conjugation.

Zygote. Cell formed by the coalescence of two cells when the nuclei become one. The most common variety of zygote is the oösperm or fertilized egg.

Zygotrocha. Order of Rotifers, characterized by the presence of two simple trochal disks.

Zylonite. Variety of celluloid, used for collars and cuffs; it contains camphor: also called xylonite.

Zymogenic Bacteria. Those which produce fermentations.


MAP OF
CUBA
ATLANTIC
OCEAN
GULF
OF MEXICO
CARIBBEAN
SEA
FLORIDA
GREAT BAHAMA BANK
OLD BAHAMA CHANNEL
NICHOLAS CHANNEL
STRAIT OF FLORIDA
REEF OF FLORIDA
EXUMA SOUND
TONGUE OF OCEAN
ANDROS ISLAND
NASSAU
TELEUTHERA ISLAND
CAYS DEL DOCE LEGUAS
YUCATAN CHANNEL
LONGITUDE 78 WEST FROM 78° GREENWICH
WASHINGTON
EAST
WEST
EXPLANATION
CAPITALS OF PROVINCES
FORTIFIED CITIES
ROADS
RAILWAYS
LIGHT HOUSES
PROVINCES
1 PINAR DEL RIO
2 HAVANA
3 MATANZAS
4 SANTA CLARA
5 PUERTO PRINCIPE
6 SANTIAGO DE CUBA
SCALE OF MILES

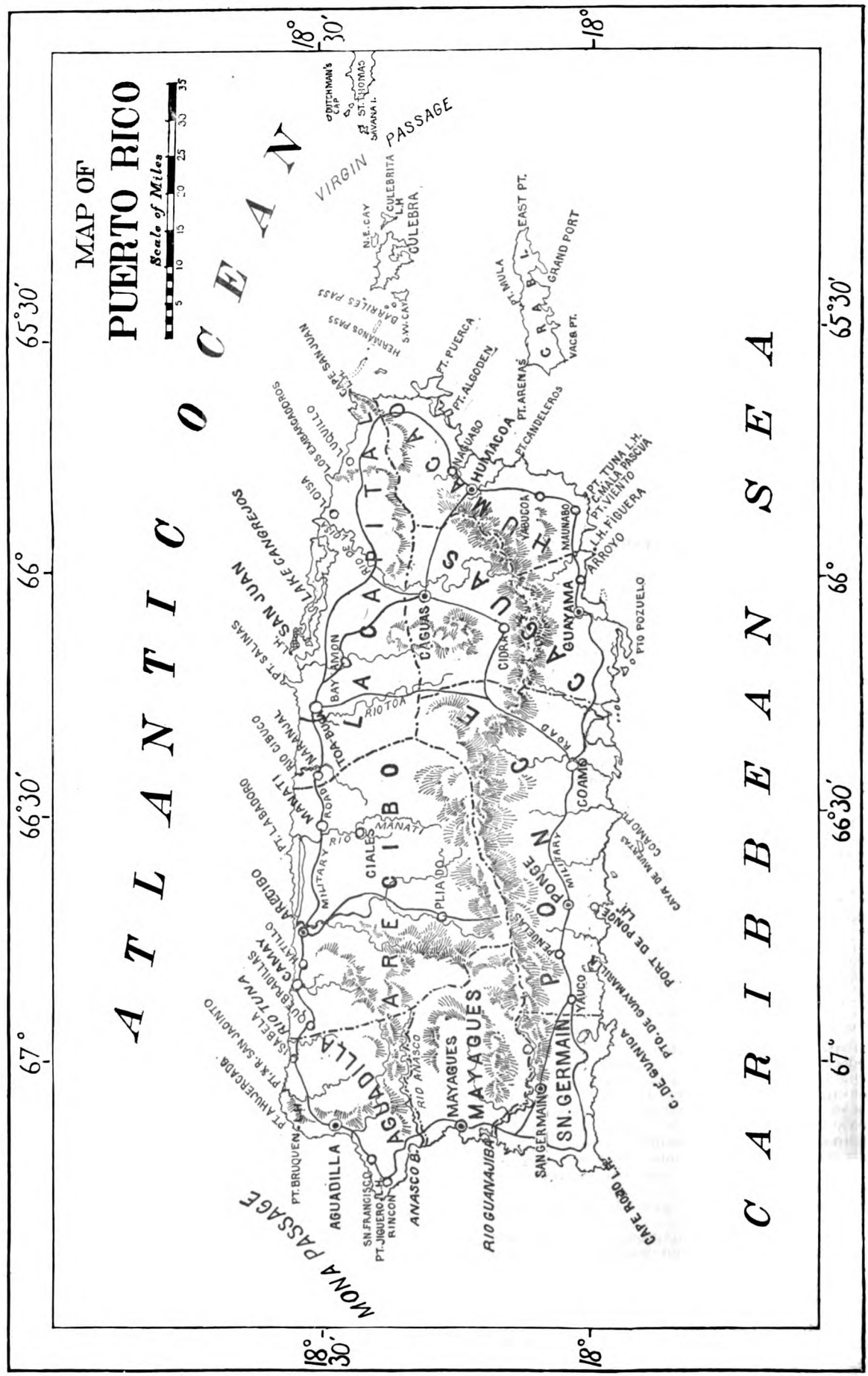
APPENDIX

Cuba. Largest island of the West Indies, between the Gulf of Mexico and the Caribbean Sea, between lat. 20°–24° N. and long. 74°–85° W.; 780 m. long. 28–143 m. wide; area 43,319 sq.m.; adjacent islands 1,400 sq.m.; coast line 2,000 m. It is separated from Florida on the north by the Straits of Florida, 130 m. wide; from Hayti on the east by the Windward Passage, 48 m. wide; from Jamaica on the south by the Carribbean Sea, 90 m. wide; from Yucatan on the west by the Yucatan Channel, 130 m. wide. It is of volcanic origin, with mountain range from e. to w., the highest at the e., 7,700 ft. Coral formations surround the island. The longest rivers are in the south, navigable for vessels of 50 tons. There are several good ports. The climate is that of the torrid zone, 77–82° F., Aug.-Sept. being the hottest months, Nov.-Feb. the coldest; rainfall 39–46 in. The highlands are healthy, the low, marshy parts unhealthy. Yellow fever is endemic. Earthquakes have occurred in the eastern end. Hurricanes take place in fall months. Pop. 1894 was estimated at ab. 1,640,000, of whom 950,000 were white creoles, 150,000 Spaniards, 500,000 negroes, 40,000 Chinese. A large portion of the land is uncultivated, consisting of virgin forests and fertile plains. In 1894–95 there were produced 1,004,264 tons of sugar; of tobacco 560,000 bales of 110 lbs., of which 338,000 bales were exported, the rest being made into cigars and cigarettes; in 1895, 48,163,846 cigarettes were exported. Other products are coffee, cacao, opium, aniseed, indigo, manihot, two crops Indian corn, cotton, hard woods, tropical fruits. Horses, mules, swine and sheep are largely raised. Iron, copper, zinc, coal, asphaltum, manganese, mercury, gold, silver, petroleum, and mineral waters are found in the eastern end. In 1897, 495,566 tons of iron ore were exported by two American companies. The imports are rice, flour, meat, wines, cottons, woolens, silks, perfumeries, and building materials. The exports in 1892 amounted to $90,000,000; and the imports $57,000,000. The revenue of the government does not exceed $30,000,000; in 1893–94 the expenditures were $26,000,000. The debt amounted in 1896 to $350,000,000 and the annual interest to $17,800,000. The principal towns are Havana, pop. 200,000; Santiago, 70,000; Puerto Principe, 45,000; Holguin, 35,000; Santo Spiritu, 30,000; Cienfuegos, 28,000; Cardenas, 24,000. C. is divided into six provinces; these and the municipalities are administered by corporations of councilors. The whole island is governed by the Captain-general, with an advisory council, which is rarely consulted. There are 16 senators and 30 deputies to the Spanish Cortes. There have been numerous revolts against the government—one, 1868–78, was formidable. The present rebellion began in 1895, under the lead of Jose Marti, Antonio and Jose Maceo, and Gomez. Gen. Martinez Campos, the Gov.-gen., endeavored to quell the rebellion by fair fighting and employing the people. He was not supported by his officers, and in 1896 was replaced by Gen. Weyler, who was energetic and cruel, and concentrated the Cubans within certain lines, near towns, who suffered from want of food and exposure. Gen. Blanco succeeded in Oct. 1897, who endeavored to conciliate the Cubans by appointments to office and the establishment of autonomous government, the Cuban parliament being inaugurated at Havana, May 1, 1898. Roads are few; ab. 1,000 m. of railroads radiate from Havana. There are ab. 2,500 m. of telegraph. The religion is Roman Catholic. Slavery was abolished 1886. C. was discovered by Columbus in 1492, settled by Spaniards 1511–15, taken by England 1762, ceded back to Spain 1763. The inhabitants found there at the discovery were Indians from Yucatan and S. America.

Hawaiian (or SANDWICH) **Islands.** Group of 12 islands in the Pacific Ocean, lat. 19–23° N. and long. 155–162° W., 2,100 m. from U.S.; 8 are inhabited, having an area of 6,740 sq.m. The others are barren rocks. They are volcanic and mountainous, high ground in the center, rich valleys to sandy shores, with coral reefs. Soil is fertile and productive. Hawaii, 4,210 sq.m., and Kauai, 640 sq.m., are supplied with rivers for irrigation, not navigable. Harbors are wanting; that of Honolulu, on Oahu 500 sq.m., has a depth of 22½ ft. Climate temperate, 52-90° F., rainfall 40–54 in. N.E. trade winds bring rain. The uplands have forests. There are no mineral resources. Rats, dogs, mice, bats, hogs are indigenous; there are also wild horses, few reptiles and 71 species of birds. Sugar, rice, coffee, bananas, wool and hides are exported; cotton, tobacco, cacao, arrowroot, yams, and all live stock, are also raised. The imports consist of groceries, provisions, clothing, grain, machinery, hardware and cotton goods. In 1896 the exports amounted to $15,436,000, of which sugar was $14,932,000, rice $195,000 and bananas $125,000. The imports amounted to $7,165,000; 92 per cent of the trade is with U.S. The public revenue in 1896 amounted to $1,997,818; expenditures $1,904,191; customs $656,896; taxes $706,542; internal revenue $168,384; debt $4,136,174; interest 5-12 per cent. Pop., 1892, 109,020; of these 31,019 were Hawaiians, 8,485 half castes, 21,616 Chinese, 24,407 Japanese, 15,191 Portuguese, 3,087 Americans, 225 British, 1,420 Germans, 378 Norwegians, 101 French, 455 Polynesians, 600 others. 7,570 were engaged in agriculture, 2,100 in fishing and navigation, 2,265 in industries, 2,031 in trade and transport, 2,580 in liberal arts, 34,498 laborers, 4,310 various. The natives are allied to Maories of New Zealand in race and language. There are 71 m. of railroad and 250 m. of telegraph in the islands. The capital is Honolulu, on Oahu; pop., 1896, 29,920. It has electric lights and tramways. Postal savings banks in 1890 had deposits of $956,999. U. S. coins constitute the money. Kalakaua was elected king 1874, with opposition of dowager Queen Emma; he died 1891. His sister Liliuokalani succeeded him. In 1893 Committee of Public Safety, of U. S. element, abrogated monarchical government and established a provisional government, applying to U. S. for annexation. July 4, 1894, a Republic was proclaimed, and Sanford B. Dole was elected President. July 7, 1898, President McKinley signed the Senate resolution annexing the Hawaiian Is. to U.S. Aug. 12 the American flag was raised over the palace in Honolulu, and President Dole and his government continued in office.

Ladrones, or MARIANA ISLANDS. Group of fifteen islands in the Pacific Ocean, lat. 13–21° N. and long. 144–146° E., area 417 sq.m. Four of the islands are inhabited, Guahan or Guam, Rota, Tinian and Aquigan; pop. 9,000; capital San Ignacio de Agaña on Guam, which island has an area of 198 sq.m. and a pop. of 7,000. The islands are of volcanic origin, mountainous and fringed with reefs. They are fertile and wooded. Rice, maize, sugar, tobacco, cotton, indigo, breadfruit, bananas, areca and cocoanut palms and castor oil are produced. Water is plentiful and the climate is salubrious, the mean temperature being 81° F. At the time of the Spanish settlement the inhabitants numbered 50,000. The present population consists of the descendants of the original inhabitants, called Chamorros, more or less mixed with Spaniards, and the Tagals from the Philippines. They are poor and indolent. The islands were discovered by Magellan in 1521 and settled by the Spaniards in 1667, since which date they have remained a Spanish colony with little revenue. In 1898, during the Spanish-American war, U. S. took possession of the group, June 21.

Philippine Islands. Extensive group of islands belonging to Spain, lat. 4–20° N., long. 116–127° E., area 114,400 sq.m., of volcanic origin, having mountains 7,800 ft. high, with coral formations on the coast and subject to earthquakes and eruptions. The climate is healthy, tropical, 79° mean temperature, March to May hottest, Nov. to Feb. coldest; N.E. wind Oct. to April, S.W. monsoon April to Oct. The soil is fertile. The flora is Malayan and Australian; ebony, teak, sandal, sappan, camphor, areca and perfume flowers abound. Pepper, tea, cinnamon, cloves, palms, manila hemp, tropical fruits, sugar, tobacco, coffee, rice, cacao, cotton, indigo, wheat, maize, ginger and vanilla are cultivated. The fauna is Asiatic and Australian; monkeys, flying lemurs, boars, buffaloes, antelopes, cockatoos, tortoises, insects, pheasants, ducks, parrots, squirrels, mollusca, fish, tarantulas and mosquitoes. Gold, galena, mercury, iron, copper, pyrites, amber, coal, sulphur and mineral waters are found here. Oxen, horses, goats, sheep and swine are raised. The ancient inhabitants are negritos (negro pigmies), with woolly hair; they are savage and repulsive and roam in bands; a few thousand of pure stock remain. Malays constitute the majority; they are Roman Catholics, live in villages, and are engaged in fishing, agriculture, shipbuilding, leather dressing, and weaving mats and linen. Chinese are numerous, and Mestizoes, a cross of the Chinese with native women; they are engaged in commerce. The Spaniards are few. Pop. 6,500,000. Luzon is the largest, 40,000 sq.m. The capital is Manila, on Luzon, pop. 160,000. Other large towns are Laoag, pop. 31,000; Lipa, 42,000; Banang, 36,000; Batangas, 34,000. The imports in 1896 amounted to $10,750,000 and exports to $37,500,000. The imports were rice, flour, wines, dress goods, petroleum and coal. The exports were sugar, tobacco, cigars, hemp, cotton manufactures and yarn. Value of sugar exported $8,000,000; hemp, $7,500,000; tobacco leaf, $2,500,000; cigars, $750,000; copra, $1,875,000. Average imports 34 per cent from Great Britain; 21 per cent from Hong Kong and Amoy; 13 per cent from Spain; 10 per cent from Singapore. Coins are Mexican dollars, with local fractional coins. Estimated revenue 1894–95, $13,579,900; expenditures, $13,282,630. There are 70 m. of railroad; 720 m. of telegraph. The P. were discovered by Magellan 1521, who


MAP OF
PUERTO RICO
Scale of Miles
5 10 15 20 25 30 35
ATLANTIC OCEAN
CARIBBEAN SEA
VIRGIN PASSAGE
MONA PASSAGE
DITCHMAN'S CAP
ST. THOMAS
SAVANA I.
CULEBRITA
LH CULEBRA
N.E. CAY
S.W. CAY
DARILLES PASS
HERMANOS PASS
CAPE SAN JUAN
LUQUILLO
LOS GABARACADOS
LOIZA
LAKE CANAREOS
SAN JUAN
PT. SALINAS
BAYAMON
RIO TOA
TOA-BAJA
NARANJAL
RIO GIBUCO
MANATI
PT. LABADORO
ARECIBO
CAMAY
HATILLO
RIO TUNA
SABELLA
PT. BRUQUEN
PT. AHUJERCADA
AGUADILLA
SN. FRANCISCO
PT. JIGUERO
RINCON
ANASCO B.
RIO ANASCO
AGUADILLA
MAYAGUES
RIO GUANAJIBO
SAN GERMAIN
SN. GERMAIN
YAUCO
PENUELAS
PONCE
MILITARY ROAD
COAMO
CIALES
MANATI
PLIADO
CIDRA
CAGUAS
GUAYAMA
ARROYO
HUMACOA
NAGUABO
YABUCOA
MAUNABO
PT. ALGODEN
PT. PUERCA
PT. ARENAS
PT. CANDELEROS
PT. MULA
EAST PT.
GRAND PORT
VACA PT.
PT. TUNA L.H.
C. MALA PASCUA
PT. VIENTO
L.H. FIGUERA
PTO POZUELO
CAYA DE MUERTAS
CORNAO PT.
PORT DE PONCE LH
PTO. DE GUAYANILLA
C. DE GUANICA
CAPE ROJO LH

was killed there soon after. Spain took possession in 1569. Manila was captured by U. S. 1898. See SPANISH-AMERICAN WAR.

Puerto Rico, or PORTO RICO. Island of the West Indies, between Hayti and Virgin Islands, 90 m. long, 36 m. wide n. and s., area 3,530 sq.m.; adjacent islands, Mona, Calebra, etc., 184 sq.m. There is a low range of mountains from e. to w., highest peak Mt. Yunque, 3,678 ft. high; along the coast are fertile plains; in the interior are large savannahs, feeding grounds for cattle. There are many rivers, chiefly running north, navigable 5-6 m., with fertile valleys, cultivated. On north coast are navigable lagoons. Coralligenous limestones chiefly predominate. There are three safe harbors, San Juan on the north, Guanica and Hovas on the south; the first named has 30 ft. of water, 24 ft. at entrance. Few severe earthquakes occur; the rainfall is abundant; the climate is salubrious, at San Juan the temperature is Jan.-Feb. 76.5° F., July-Aug. 83.2° F. On mountains are a few tropical forests. No reptiles or serpents. Sugar, coffee, tobacco, maize, rice, cotton and cattle are raised. The pop. in 1887 was 813,937, of which 300,000 were negroes, the balance chiefly Spanish, originally from Andalusia, the Balearic Islands and Spanish colonies, fugitives 1810-25. The dense native population found there by the Spaniards was exterminated. The religion is Roman Catholic with the archbishop at Santiago de Cuba. The government is from Spain, by a Captain-General. Education is backward. The roads are good. Railroads have 137 m., 170 under construction. Telegraph extends 470 m. Revenue, 1894-5, $5,454,958; expenditures, $3,905,667; exports, 1895, $15,799,000; imports, $17,466,000; exports, 1896, coffee 26,655 tons, sugar 54,205 tons, molasses 14,740 tons, tobacco 1,039 tons. P. R. was discovered by Columbus 1493, Ponce de Leon founded town of Caparra 1510. The important towns are San Juan, the capital, pop. 23,414; Ponce, 37,545, San German, 30,146. Oct. 18, 1898, U.S. flag raised at San Juan, the Spanish army having evacuated the island.

Spanish-American War, 1898. IMPORTANT EVENTS.

Sept. 23, 1897.—Gen. Stewart L. Woodford, U. S. Minister to Spain, presented a note to the Duke of Tetuan, Minister of Foreign Affairs, stating that American interests were suffering from the Cuban insurrection. Señor Sagasta of the succeeding cabinet in reply expressed the hope that proposed reforms would pacify the island, especially if the U. S. Government would check filibustering expeditions fitted out by American sympathizers.

Feb. 15, 1898.—U. S. battleship "Maine" blown up in the harbor of Havana; 266 men killed.

April 11.—Message of President McKinley recommending that he be empowered by Congress to intervene in Cuba, without recognizing the Republic.

April 20.—The President signed the joint resolutions to that effect. Ultimatum sent to Spain and Spanish Minister Polo left Washington.

April 21.—The North Atlantic Squadron ordered to blockade Cuba. U. S. Minister Woodford left Madrid.

April 23.—Call for 125,000 volunteers issued.

April 24.—War formally declared by Spain.

April 25.—War formally declared by United States; dating from April 21.

April 27.—The flagship "New York," cruiser "Cincinnati" and monitor "Puritan" bombarded Matanzas.

April 29.—Spanish squadron under Admiral Cervera, consisting of the cruisers "Almirante Oquendo," "Cristobal Colon," "Viscaya" and "Maria Teresa," and torpedo-boat destroyers "Terror," "Furor" and "Pluton," sailed from Cape Verde Islands.

May 1.—Rear-admiral George Dewey, commanding U. S. Asiatic Squadron, destroyed the Spanish fleet, under Admiral Montojo, at Manila, capital of the Philippines. The U.S. fleet consisted of cruisers "Olympia," "Baltimore," "Boston" and "Raleigh," gunboats "Petrel" and "Concord," revenue cutter "McCulloch," and two transports. The Spanish fleet consisted of eleven warships, including the cruisers "Reina Cristina," "Velasco," "Castilla," "Don Juan de Austria," "Isla de Cuba," three gunboats and three other vessels. U.S. loss, none killed, six wounded, and no serious injury to the ships; Spanish loss, two commanders, 700 men killed and wounded, and all their ships.

May 9.—Thanks of Congress given to Acting Rear-admiral George Dewey.

May 11.—U.S. vessels "Wilmington," "Winslow" and "Hudson" were engaged by Spanish gunboats and shore batteries at Cardenas, Cuba. Loss of U.S. five killed, four wounded, and "Winslow" disabled.—Gen. Wesley Merritt selected for Military Governor of the Philippines.

May 12.—First land fight of the war at Port Cabanas, Cuba.—Rear-admiral Sampson, with a portion of his squadron, bombarded batteries at San Juan, Porto Rico, doing much damage. Loss, two killed, seven wounded.

May 19.—Spanish fleet under Admiral Cervera arrived at Santiago de Cuba.

May 25.—75,000 more volunteers called for by the President; 2,500 troops sail for Manila.

May 31.—Fortifications of Santiago bombarded.

June 1.—Rear-admiral Sampson took command of the fleet off Santiago.

June 3.—Assistant Naval Constructor Hobson and seven men sunk the "Merrimac," a collier, in the entrance to Santiago harbor.

June 6.—Spanish batteries and fleet at Santiago bombarded.

June 10.—Skirmishing at Caimanera, Guantanamo Bay, between 600 marines and the Spanish soldiers, continuing several days.

June 13.—Brig.-gen. Shafter with Fifth Army Corps, consisting of 773 officers and 14,564 enlisted men, sailed from Tampa for Santiago.—War Revenue Bill signed.

June 15.—4,200 soldiers embark from San Francisco for Manila.

June 17.—Spanish fleet of ten vessels under Admiral Camara sailed from Cadiz for Manila, passing through the Suez Canal and then returning.

June 20.—Gen. Shafter's first division arrived off Santiago.

June 22.—Gen. Shafter's troops began to land at Baiquiri and Siboney, near Santiago.

June 24.—Engagement at La Guasima, near Sevilla; dismounted cavalry repulsed the Spaniards, with loss of 16 killed and 52 wounded. Roosevelt's Rough Riders lost 18 killed and 34 wounded.

June 27.—Third expedition set sail for Manila.

June 28.—Southern ports of Cuba blockaded.

July 1.—Gen. Lawton took El Caney and Gen. Kent took San Juan Hill overlooking Santiago, with loss of 231 killed and 1,364 wounded, on this day and July 2 when the Spanish endeavored to retake them.

July 3.—Admiral Cervera's squadron endeavored to escape from Santiago harbor, but were destroyed by the U. S. fleet. U. S. loss 1 killed, 2 wounded; Spanish loss probably several hundred. Prisoners ab. 1,300, including Admiral Cervera. Gen. Shafter demanded the surrender of Santiago by Gen. José Toral, who refused.

July 7.—Hawaiian Annexation Bill signed by the President.

July 10.—Attack on Santiago renewed by the ships and artillery, Gen. Toral having finally refused to surrender unconditionally.

July 11.—Gen. Shafter's available force before Santiago was 22,500 fighting men; total killed, wounded and sick 3,000.

July 17.—Gen. Toral surrendered his troops and eastern part of the province of Santiago, the number of troops being 24,000, including 12,000 not in the defenses of the city of Santiago.

July 19.—6,200 troops embark from Tampa for Porto Rico.

July 20.—Gen. Leonard Wood appointed military Governor of Santiago.

July 25.—Gen. Nelson A. Miles, with U. S. troops, lands at Guanica, Porto Rico, which had surrendered to the "Gloucester."

July 26.—French Ambassador, Jules Cambon, on behalf of Spain, asked for terms of peace.

July 28.—Ponce, Porto Rico, surrendered to Gen. Miles.

July 30.—President McKinley's terms for peace were given to the French ambassador. They included independence of Cuba, cession of Porto Rico and one of the Ladrones, and retention of Manila until final disposition of the Philippines by a joint commission.

July 31.—U. S. troops repulse Spaniards at Malate, near Manila.

Aug. 5.—Guyama, Porto Rico, captured.

Aug. 9.—Coamo, Porto Rico, captured. Spain accepted the President's terms of peace.

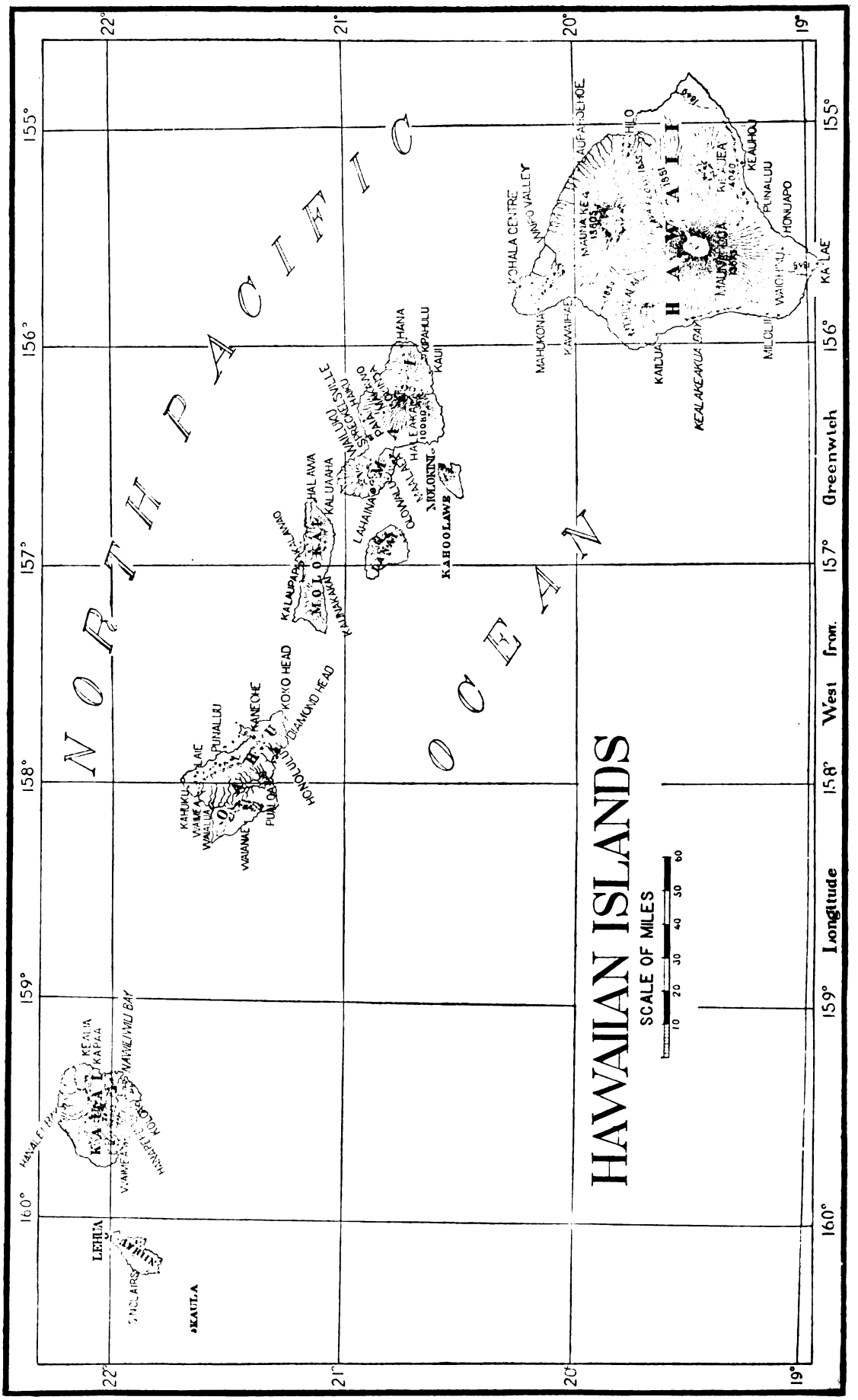
Aug. 10.—Engagement near Hormigueros, Porto Rico, Spaniards defeated, U. S. loss 1 killed, the first U. S. soldier killed in Porto Rico, 16 wounded.

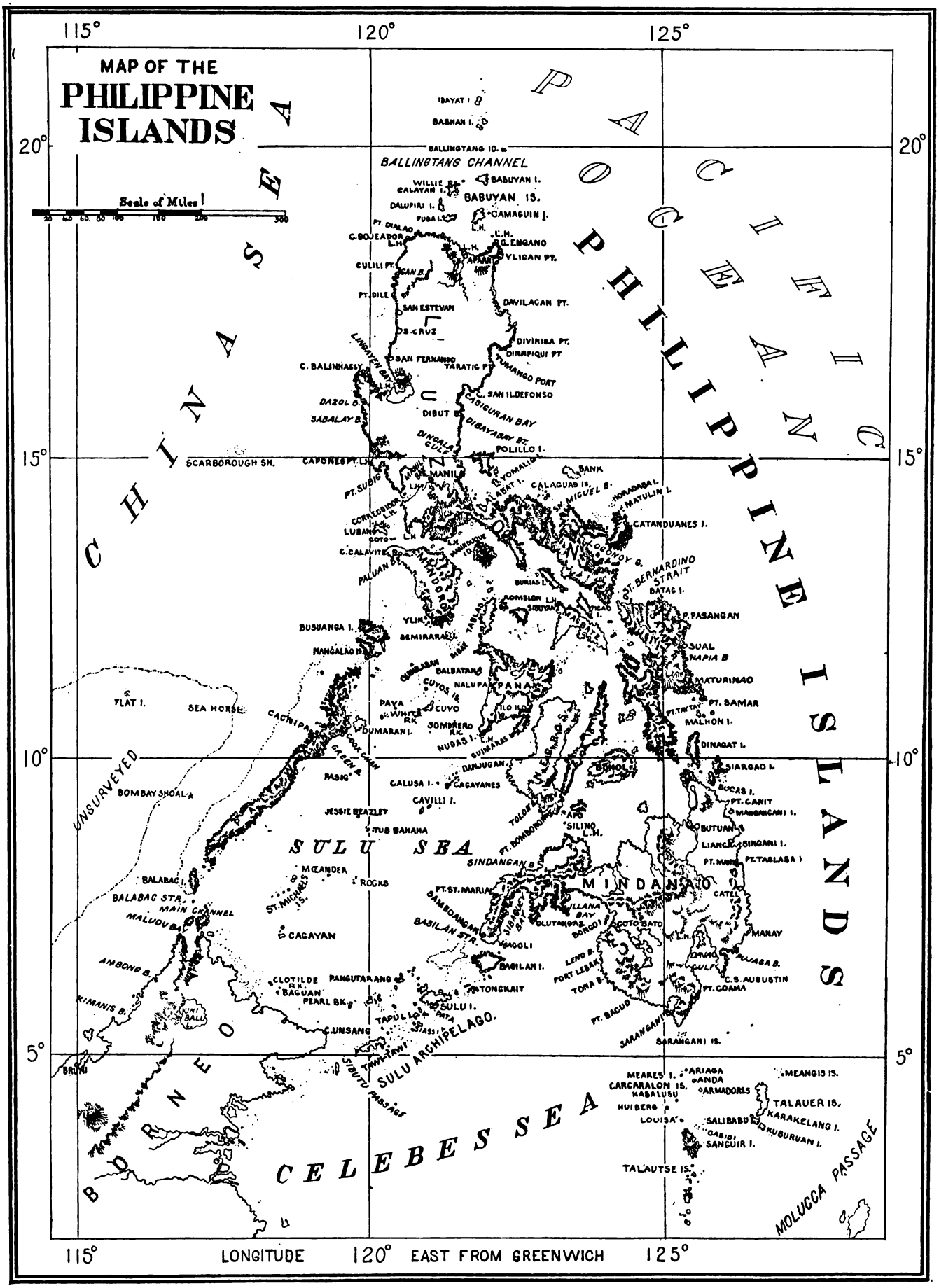
Aug. 12.—Protocols for preliminaries for a treaty of peace, in accordance with the President's terms, signed by Sec. of State Day and the French Ambassador Cambon. Hostilities suspended and blockades lifted. Peace Commission to meet in Paris by Oct. 1, five from each government. Commissioners to be appointed to arrange the details of evacuation of Cuba and Porto Rico.

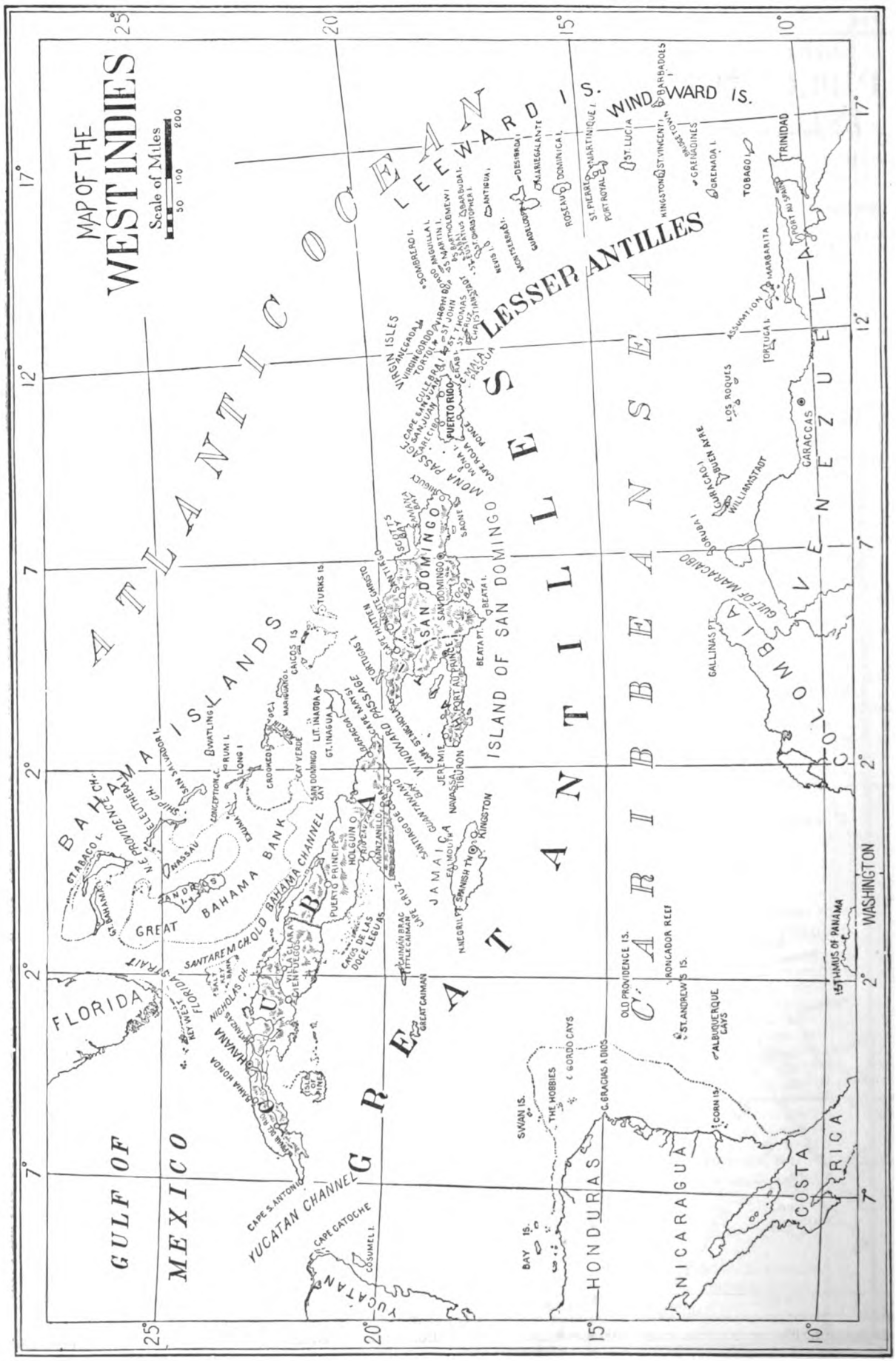
Aug. 13.—Manila surrendered, U.S. loss 8 killed, 40 wounded.

Peace Commissioners for U. S. William R. Day, ex-Secretary of State, Senator Cushman K. Davis, Senator William R. Frye, Senator George Gray, Whitelaw Reid.

The total number of deaths due to the war to Sept. 30, is 2,906, of whom 107 were officers; of this number 2,600 died in camp or on furlough, 80 of whom were officers. The cost of the war to Oct. 30 was $40,277,364 for the Navy and $124,654,863 for the Army; total cost, $164,932,227.


HAWAIIAN ISLANDS
SCALE OF MILES
10 20 30 40 50 60
NORTH PACIFIC OCEAN
Longitude West from Greenwich
155° 156° 157° 158° 159° 160°
19° 20° 21° 22°
KAUAI
NIIHAU
LEHUA
KAULA
NIHOA
NECKER
KAPAA
KEALIA
HANALEI BAY
HALEIWA
WAIALUA
WAIANAE
KAHUKU
LAIE
PUNALUU
KANEOHE
KOKO HEAD
DIAMOND HEAD
HONOLULU
PUNCHBOWL
KALAUPAPA
MOLOKAI
KALAWAO
HALAWA
KALUAAHA
KAPAKAHI
LAHAINA
MAUI
HANA
KIPAHULU
HALEAKALA
MOLOKINI
KAHOOLAWE
KOHALA CENTRE
MAUNA KEA
MAUNA LOA
HILO
KAUPAHOEHOE
KEAUHOU
PUNALUU
HONUAPO
KAILUA
KEALAKEAKUA BAY
MILOLII
WAIOHINU
KA'LAE


MAP OF THE
PHILIPPINE
ISLANDS
Scale of Miles
115°
120°
125°
20°
15°
10°
5°
CHINA SEA
PACIFIC OCEAN
PHILIPPINE ISLANDS
BALLINGTANG CHANNEL
BABUYAN IS.
MANILA
SCARBOROUGH SH.
SULU SEA
MINDANAO
SULU ARCHIPELAGO
CELEBES SEA
BORNEO
UNSURVEYED
MOLUCCA PASSAGE
LONGITUDE 120° EAST FROM GREENWICH


MAP OF THE
WEST INDIES
Scale of Miles
50 100 200
ATLANTIC OCEAN
LEEWARD IS.
WINDWARD IS.
LESSER ANTILLES
GREATER ANTILLES
BAHAMA ISLANDS
GULF OF MEXICO
FLORIDA
GREAT BAHAMA BANK
BAHAMA CHANNEL
YUCATAN CHANNEL
YUCATAN
CUBA
HAVANA
JAMAICA
KINGSTON
ISLAND OF SAN DOMINGO
SAN DOMINGO
PUERTO RICO
VIRGIN ISLES
MONA PASSAGE
WINDWARD PASSAGE
TURKS IS.
CAICOS IS.
CAYMAN IS.
GREAT CAYMAN
SWAN IS.
THE HOBBIES
GORDO CAYS
OLD PROVIDENCE IS.
RONCADOR REEF
ST. ANDREWS IS.
ALBUQUERQUE CAYS
CORN IS.
BAY IS.
HONDURAS
NICARAGUA
COSTA RICA
VENEZUELA
GULF OF MARACAIBO
CARACAS
WILLIAMSTADT
CURACAO I.
BONAIRE I.
BUEN AYRE
LOS ROQUES
ASSUMPTION
MARGARITA
TORTUGA I.
TRINIDAD
PORT OF SPAIN
TOBAGO I.
GRENADA I.
GRENADINES
ST. VINCENT I.
KINGSTON
ST. LUCIA
MARTINIQUE I.
ST. PIERRE
PORT ROYAL
BARBADOS I.
DOMINICA I.
ROSEAU
GUADELOUPE
MARIEGALANTE
DESIRADE I.
MONTSERRAT
NEVIS I.
ANTIGUA
ST. CHRISTOPHER I.
ST. THOMAS
ST. JOHN
ST. CROIX
VIRGIN GORDA
TORTOLA
ANEGADA
ANGUILLA I.
ST. MARTIN I.
ST. BARTHOLEMEW I.
SOMBRERO I.
GALLINAS PT.
WASHINGTON
ISTHMUS OF PANAMA
CAPE ST. ANTONIO
CAPE CATOCHE
COZUMEL I.
GREAT INAGUA
LIT. INAGUA
SAN DOMINGO CAY
CAYVERDE
CAICOS IS.
TURKS IS.
MARIGUANA I.
CROOKED I.
LONG I.
RUM I.
WATLING I.
SAN SALVADOR I.
NEW PROVIDENCE CH.
ELEUTHERA I.
ABACO I.
NASSAU
ANDROS I.
CONCEPTION I.
ELANA
SHIP CH.
NICHOLAS CH.
SANTAREM CH.
OLD BAHAMA CHANNEL
PUERTO PRINCIPE
HOLGUIN
CAYO SANTO DOMINGO
CAYO DE LAS DOCE LEGUAS
CAPE CRUZ
SANTIAGO DE CUBA
GUANTANAMO BAY
NAVASSA I.
TIBURON
JEREMIE
CAPE ST. MICHOLAS
PORT AU PRINCE
BEATA I.
BEATA PT.
SAONE
MONTE CRISTO
CAPE MONTE CRISTO
CAPE HAITIEN
MARIGOT
SAVANNA
SAMANA BAY
CAPE CABRON
CAPE ENGANO
CAPE MALA PASCUA
MONA I.
CAPE ROJA
PONCE
CAPE SAN JUAN
ARECIBO
CULEBRA I.
VIEQUES I.
CAPE SAN ANTONIO
SAN JUAN
CAPE ANGUILLA
SOMBRERO I.
ANEGADA I.
VIRGIN GORDA
TORTOLA
ST. JOHN
ST. THOMAS
ST. CROIX
ST. BARTHOLEMEW I.
ST. MARTIN I.
ANGUILLA I.
SOMBRERO I.
NEGRILL PT.
SPANISH TN.
GREAT CAYMAN
LITTLE CAYMAN
PUNTA BRAC
CAPE CRUZ
JAMAICA
KINGSTON
PALMOLIA
NAVASSA I.
TIBURON
JEREMIE
PORT AU PRINCE
BEATA I.
BEATA PT.
SAN DOMINGO
SAONE
MONTE CRISTO
CAPE MONTE CRISTO
CAPE HAITIEN
MARIGOT
SAVANNA
SAMANA BAY
CAPE CABRON
CAPE ENGANO
CAPE MALA PASCUA
MONA I.
CAPE ROJA
PONCE
CAPE SAN JUAN
ARECIBO
CULEBRA I.
VIEQUES I.
CAPE SAN ANTONIO
SAN JUAN
CAPE ANGUILLA
SOMBRERO I.
ANEGADA I.
VIRGIN GORDA
TORTOLA
ST. JOHN
ST. THOMAS
ST. CROIX
ST. BARTHOLEMEW I.
ST. MARTIN I.
ANGUILLA I.
SOMBRERO I.
NEGRILL PT.
SPANISH TN.
GREAT CAYMAN
LITTLE CAYMAN
PUNTA BRAC
CAPE CRUZ
JAMAICA
KINGSTON
PALMOLIA
NAVASSA I.
TIBURON
JEREMIE
PORT AU PRINCE
BEATA I.
BEATA PT.
SAN DOMINGO
SAONE
MONTE CRISTO
CAPE MONTE CRISTO
CAPE HAITIEN
MARIGOT
SAVANNA
SAMANA BAY
CAPE CABRON
CAPE ENGANO
CAPE MALA PASCUA
MONA I.
CAPE ROJA
PONCE
CAPE SAN JUAN
ARECIBO
CULEBRA I.
VIEQUES I.
CAPE SAN ANTONIO
SAN JUAN
CAPE ANGUILLA
SOMBRERO I.
ANEGADA I.
VIRGIN GORDA
TORTOLA
ST. JOHN
ST. THOMAS
ST. CROIX
ST. BARTHOLEMEW I.
ST. MARTIN I.
ANGUILLA I.
SOMBRERO I.
25°
20°
15°
10°
17°
12°
7°
2°

FOREIGN WEIGHTS AND MEASURES

The following table embraces only such weights and measures as are given from time to time in U. S. CONSULAR REPORTS and in Commercial Relations:

Foreign weights and measures, with American equivalents.

Denominations	Where used	American equivalents
Almude	Portugal	4.422 gallons
Ardeb	Egypt	7.6907 bushels
Are	Metric	0.02471 acre
Arobe	Paraguay	25 pounds
Arratel or libra	Portugal	1.011 pounds
Arroba (dry)	Argentine Republic	25.3175 pounds
Do	Brazil	32.38 pounds
Do	Cuba	25.3664 pounds
Do	Portugal	32.38 pounds
Do	Spain	25.36 pounds
Do	Venezuela	25.4024 pounds
Arroba (liquid)	Cuba, Spain, Venezuela	4.263 gallons
Arshine	Russia	28 inches
Arshine (square)	do	5.44 square feet
Artel	Morocco	1.12 pounds
Baril	Argentine Rep. & Mex	20.0787 gallons
Barrel	Malta (customs)	11.4 gallons
Do	Spain (raisins)	100 pounds
Berkovets	Russia	361.12 pounds
Bongkal	India	832 grains
Bouw	Sumatra	7.096.5 sq. meters
Bu	Japan	0.1 inch
Butt (wine)	Spain	140 gallons
Caffiso	Malta	5.4 gallons
Candy	India (Bombay)	529 pounds
Do	India (Madras)	500 pounds
Cantar	Morocco	113 pounds
Do	Syria (Damascus)	575 pounds
Do	Turkey	124.7036 pounds
Cantaro (cantar)	Malta	175 pounds
Carga	Mexico and Salvador	300 pounds
Catty	China	1.333⅓ (1⅓) pounds
Do	Japan	1.31 pounds
Do	Java, Siam, Malacca	1.35 pounds
Do	Sumatra	2.12 pounds
Centaro	Central America	4.2631 gallons
Centner	Bremen & Brunswick	117.5 pounds
Do	Darmstadt	110.24 pounds
Do	Denmark & Norway	110.11 pounds
Do	Nuremberg	112.43 pounds
Do	Prussia	113.44 pounds
Do	Sweden	93.7 pounds
Do	Vienna	123.5 pounds
Do	Zollverein	110.24 pounds
Do	Double or metric	220.46 pounds
Chih	China	14 inches
Coyan	Sarawak	3.098 pounds
Do	Siam (Koyan)	2,667 pounds
Cuadra	Argentine Republic	4.2 acres
Do	Paraguay	78.9 yards
Do	Paraguay (square)	8.077 square feet
Do	Uruguay	Nearly 2 acres
Cubic Meter	Metric	35.3 cubic feet
Cwt. (hundredwt)	British	112 pounds
Dessiatine	Russia	2.6997 acres
Do	Spain	1.599 bushels
Drachme	Greece	Half ounce
Dun	Japan	1 inch
Fanega (dry)	Central America	1.5745 bushels
Do	Chile	2.575 bushels
Do	Cuba	1.599 bushels
Do	Mexico	1.54728 bushels
Do	Morocco	Strike fanega, 70 lbs.; full fanega, 118 pounds
Do	Uruguay (double)	7.776 bushels
Do	Uruguay (single)	3.888 bushels
Do	Venezuela	1.599 bushels
Fanega (liquid)	Spain	16 gallons
Feddan	Egypt	1.03 acres
Frail (raisins)	Spain	50 pounds
Frasco	Argentine Republic	2.5096 quarts
Do	Mexico	2.5 quarts
Fuder	Luxemberg	264.17 gallons
Garnice	Russian Poland	0.88 gallon
Gram	Metric	15.432 grains
Hectare	do	2.471 acres
Hectoliter (dry)	do	2.838 bushels
Do (liquid)	do	26.417 gallons
Joch	Austria-Hungary	1.422 acres
Ken	Japan	4 yards
Kilogram (kilo)	Metric	2.2046 pounds
Kilometer	do	0.621376 mile
Klafter	Russia	216 cubic feet
Kota	Japan	5.13 bushels
Korree	Russia	3.5 bushels
Last	Belgium & Holland	85.134 bushels
Do	England (dry malt)	82.52 bushels
Do	Germany	2 metric tons (4,480 pounds)
Do	Prussia	112.29 bushels
Do	Russian Poland	11⅜ bushels
Do	Spain (salt)	4,760 pounds
League (land)	Paraguay	4,633 acres
Li	China	2,115 feet
Libra (pound)	Castilian	7,100 grains (troy)
Do	Argentine Republic	1.0127 pounds
Do	Central America	1.043 pounds
Do	Chile	1.014 pounds
Do	Cuba	1.0161 pounds
Do	Mexico	1.01465 pounds
Do	Peru	1.0143 pounds
Do	Portugal	1.011 pounds
Do	Uruguay	1.0143 pounds
Do	Venezuela	1.0161 pounds
Liter	Metric	1.0567 quarts
Livre (pound)	Greece	1.1 pounds
Do	Guiana	1.0791 pounds
Load	England (timber)	Sq., 50 cu. ft.; unhewn, 40 cu. ft.; inch planks, 600 superfi'l ft.
Manzana	Costa Rica	1⅝ acres
Do	Nicaragua & Salvador	1.727 acres
Marc	Bolivia	0.507 pound
Maund	India	82⅔ pounds
Meter	Metric	39.37 inches
Mil	Denmark	4.68 miles
Do	do (geographical)	4.61 miles
Milla	Nicaragua & Honduras	1.1493 miles
Morgen	Prussia	0.63 acre
Oke	Egypt	2.7225 pounds
Do	Greece	2.84 pounds
Do	Hungary	3.0817 pounds
Do	Turkey	2.85418 pounds
Do	Hungary & Wallachia	2.5 pints
Pic	Egypt	21¼ inches
Picul	Borneo and Celebes	135.64 pounds
Do	China, Japan, Sumatra	133⅓ pounds
Do	Java	135.1 pounds
Do	Philippine Islands (hemp)	139.45 pounds
Do	do (sugar)	140 pounds
Pie	Argentine Republic	0.9478 foot
Do	Castile	0.91407 foot
Pik	Turkey	27.9 inches
Pood	Russia	36.112 pounds.
Pund (pound)	Denmark and Sweden	1.102 pounds.
Quarter	Great Britain	8.252 bushels.
Do	London (coal)	36 bushels.
Quintal	Argentine Republic	101.42 pounds.
Do	Brazil	130.06 pounds.

Quintal	Castile, Chile, Mex., Peru	101.61 pounds.
Do	Greece	123.2 pounds.
Do	Newfoundland (fish)	112 pounds.
Do	Paraguay	100 pounds.
Do	Syria	125 pounds.
Do	Metric	220.46 pounds.
Rottle	Palestine	6 pounds.
Do	Syria	5¼ pounds.
Sagen	Russia	7 feet.
Salm	Malta	490 pounds.
Se	Japan	3.6 feet.
Seer	India	1 pound 13 ounces.
Shaku	Japan	10 inches.
Sho	do	1.6 quarts.
Standard (St. Petersburg)	Lumber measure	165 cubic feet.
Stone	British	14 pounds.
Suerte	Uruguay	2,700 cuadras (see cuadra).
Tael	Cochin China	590.75 grains (troy)
Tan	Japan	0.25 acres.
To	Japan	2 pecks.
Ton	Space measure	40 cubic feet
Tonde (cereals)	Denmark	3.94783 bushels.
Tondeland	do	1.36 acres.
Tsubo	Japan	6 feet square.
Tsun	China	1.41 inches.
Tunna	Sweden	4.5 bushels.
Tunnland	do	1.22 acres.
Vara	Argentine Republic	34.1208 inches.
Do	Castile	0.914117 yard.
Do	Central America	32.87 inches.
Do	Chile and Peru	33.367 inches.
Do	Cuba	33.384 inches.
Do	Curaçoa	33.375 inches.
Do	Mexico	33 inches.
Do	Paraguay	34 inches.
Do	Venezuela	33.384 inches.
Vedro	Russia	2.707 gallons.
Vergees	Isle of Jersey	71.1 square rods.
Verst	Russia	0.663 mile.
Vlocka	Russian Poland	41.88 acres.

METRIC WEIGHTS AND MEASURES

Metric weights.

Milligram ($\frac{1}{1000}$ gram) equals 0.0154 grain.
Centigram ($\frac{1}{100}$ gram) equals 0.1543 grain.
Decigram ($\frac{1}{10}$ gram) equals 1.5432 grains.
Gram equals 15.432 grains.
Decagram (10 grams) equals 0.3527 ounce.
Hectogram (100 grams) equals 3.5274 ounces.
Kilogram (1,000 grams) equals 2.2046 pounds.
Myriagram (10,000 grams) equals 22.046 pounds.
Quintal (100,000 grams) equals 220.46 pounds.
Millier or tonnea—ton (1,000,000 grams) equals 2,204.6 pounds.

Metric dry measures.

Milliliter ($\frac{1}{1000}$ liter) equals 1.061 cubic inch.
Centiliter ($\frac{1}{100}$ liter) equals 0.6102 cubic inch.
Deciliter ($\frac{1}{10}$ liter) equals 6.1022 cubic inches.
Liter equals 0.908 quart.
Decaliter (10 liters) equals 9.08 quarts.
Hectoliter (100 liters) equals 2.838 bushels.
Kiloliter (1,000 liters) equals 1.308 cubic yards.

Metric liquid measures.

Milliliter ($\frac{1}{1000}$ liter) equals 0.0388 fluid ounce.
Centiliter ($\frac{1}{100}$ liter) equals 0.338 fluid ounce.
Deciliter ($\frac{1}{10}$ liter) equals 0.845 gill.
Liter equals 1.0567 quarts.
Decaliter (10 liters) equals 2.6418 gallons.
Hectoliter (100 liters) equals 26.418 gallons.
Kiloliter (1,000 liters) equals 264.18 gallons.

Metric measures of length.

Millimeter $\frac{1}{1000}$ meter) equals 0.0394 inch.
Centimeter $\frac{1}{100}$ meter) equals 0.3937 inch.
Decimeter ($\frac{1}{10}$ meter) equals 3.937 inches.
Meter equals 39.37 inches.
Decameter (10 meters) equals 393.7 inches.
Hectometer (100 meters) equals 0.62137 mile (3,280 feet 10 in.)

Metric Surface Measures.

Centare (1 square meter) equals 1,550 square inches.
Are (100 square meters) equals 119.6 square yards.
Hectare (10,000 square meters) equals 2.471 acres.

DEATH, DATES OF.

Abbey, Henry E., 1896.
Adams, W. T., 1887.
Alcock, Sir Rutherford, 1897.
Armitage, Thomas, 1896.
Aumale, Duc d', 1897.
Baillon, Henri E., 1895.
Bangs, J. K., born 1862.
Barlow, Francis C., 1896.
Barnby, Sir Joseph, 1895.
Barthelemy, St. Hilaire, 1895.
Beecher, Edward, 1895.
Bellamy, Edward, 1898.
Benson, Edward W., 1896.
Bessemer, Sir Henry, 1897.
Bismarck-Schönhausen, Otto, 1898.
Blind, Mathilde, 1846–1896.
Bonaparte, Lucien L., 1895.
Boyesen Hjalmar H., 1895.
Brahms, Johannes, 1897.
Broadus, John A., 1895.
Bruckner, Anton, 1896.
Burne-Jones, E., 1898.
Calderwood, Henry, 1897.
Campanini, Italo, 1897.
Carriere, Moritz, 1895.
Cayley, Arthur, 1895.
Cernuschi, E., 1896.
Child, Francis J., 1896.
Childers, Hugh C. E., 1896.
Clark, Alvan G., 1897.
Clarke, Mary C., 1898.
Coffin, Charles C., 1896.
Cope, Edward D., 1897.
Coxe, Arthur C., 1896.
Crisp, Charles F., 1896.
Crosland, Camille, 1895.
Crowe, Joseph A., 1896.
Dana, Charles A., 1897.
Daubrée, G., 1896.
Daudet, Alphonse, 1897.
Davenport, Fanny L. G., 1898.
Dawson, George M., 1895.
Delano, Columbus, 1896.
Dodge, Mary A., 1896.
Dodgson, Charles L., 1898.
Dorsey, James O., 1895.
Dow, Neal, 1897.
Drisler, Henry, 1897.
Drummond, Henry, 1897.
Dumas, Jean B. A., 1896.
Eaton, Wyatt, 1896.
Engels, Friedrich, 1895.
English, William H., 1896.
Fairchild, Lucius, 1896.
Ferry, Thomas W., 1896.
Field, Kate, 1896.
Fink, Albert, 1897.
Forbes, Edwin, 1895.
Frere-Orban, Hubert J. W., 1896.
Fresenius, Carl R., 1897.
George, Henry, 1897.
George, J. Z., 1897.
Gibson, William H., 1896.
Gilbert, Sir John, 1897.
Gladstone, William E., 1898.
Goncourt, Edmond L., 1896.
Goode, George B., 1896.
Gould, Benjamin A., 1896.
Grove, William R., 1896.
Hale, Horatio, 1896.
Harris, Isham G., 1897.
Haughton, Samuel, 1897.
Haygood, Atticus G., 1896.
Heidenhain, Rudolf P., 1897.
Holman, Wm. S., 1897.
Hoppin, Augustus, 1896.
Ingelow, Jean, 1897.
Ismail, Pacha, 1895.
Kekule, Frederich A., 1896.
La Villemarque, Theodore, 1895.
Linton, William J., 1897.
Ludwig, Karl, 1895.
Lusk, William T., 1897.
Martin, Homer D., 1897.
Mayer, Alfred M., 1897.
Mercur, James, 1896.
Meredith, Louisa A., 1895.
Meyer, Victor, 1897.
Morfit, Campbell, 1897.
Mutsu, Hito, 1897.
Nemours, Louis Charles, 1896.
Newman, Francis W., 1897.
Oliphant, Margaret, 1897.
Overbeck, Johann A., 1895.
Owen, John, born 1833.
Palgrave, Francis T., 1897.
Parkes, Sir Henry, 1896.
Parvin, Theophilus, 1898.
Payn, James, 1898.
Pepper, William, 1898.
Pilling, James C., 1895.
Playfair, Sir Lyon, 1898.
Plimsoll, Samuel, 1898.
Poole, Marian L., 1898.
Preyer, T. W., 1897.
Pullman, George M., 1897.
Quain, Richard, 1898.
Quintard, Charles T., 1898.
Raymond, Hippolyte, born 1844.
Remenyi, Edward, 1898.
Rhind, Alex. C., 1897.
Riehl, Wilhelm H., 1897.
Rosecrans, William S., 1898.
Rudinger, Nicolaus, 1896.
Rutimeyer, Ludwig, 1895.
Sachs, Julius, 1897.
Seidl, Anton, 1898.
Singerly, William M., 1898.
Smith, Robert P., 1895.
Steenstrup, Johannes, 1897.
Stetefeldt, C., 1898.
Talifero, William B., 1898.
Waring, G. E., 1898.